DECEMBER
1938

MECHANIX ILLUSTRATED

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ECIAL PHOTOGRAPHY
CTION • SEE PAGE 107

ST. LOUIS
PERIODICAL ROOM

THRILLS AND SPILLS
WITH MIDGET RACERS

Daring Death for Underwater Gold

"GOODBYE WORLD! MY SHIP FADED INTO THE NIGHT!"

OVERBOARD IN STORM, YACHTSMAN CLINGS TO CAPSIZED DORY AS SLOOP HOLDS COURSE

❶ "My 40-foot sloop was footing it up Long Island Sound like a scared cat before a stiff sou'-west breeze," writes Tom Meyer of 280 Bronxville Road, Bronxville, N. Y. "At midnight...

❷ ...off Smithtown Bay, it really began to blow. My partner, Larry Starr, was asleep below, and I gave the tiller to a friend who had done no sailing before, so I could get the dinghy in on deck before it got away from us. Then, with the darn thing half-way on board a big comber pounded over the stern, swept my feet out from under me and overboard I went, weighted down with boots and oilskins. I still clung to the dinghy, but its line had parted and my ship faded quickly into the black night!

❸ "The lad at the tiller didn't know how to bring the ship about, and although he would wake Larry, they'd be too far away to ever find me in that roaring darkness.

"I was growing numb with cold. I couldn't hang on much longer. I rolled against the gunwale of the dinghy for a fresh grip on the world that was slipping away from me. Something hard dug into my side... the flashlight in my pocket! Soaked, though it was, here was a chance!

❹ "I pressed the switch. A finger of light stabbed through the storm. Time dragged on as I played the light about me. I cursed my shipmates. 'Why can't the fools see my light?' and then...the beam caught the white sail! I screamed for joy. An arm waved encouragement. Minutes later, thanks to those *fresh* DATED 'Eveready' batteries that kept working under the toughest conditions imaginable. I was warm and happy in my own bunk on my own ship, our Block Island cruise resumed.

(Signed) Tom Meyer"

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TOY INVENTIONS

(Make money while you play!)

IN THE basement of a private house in Rochester, N. Y., Edward S. Savage works amid a weird collection of fantastic figures. This is the workshop of Fairyland where toys are born, for Mr. Savage is America's No. 1 toy inventor. With the Walking Pig, the Crawling Bug, Jack the Kicking Donkey and Otto the Snoopy Sniffer as his companions, the man whose gadgets delight children and grown-ups thinks up the ideas that net him a modest fortune. How this toy inventor makes money while he plays will be told in the January issue.

"CRACKING Down On Quacks," the story of those mail order operators whose wonder-working lotions, stretching devices and other impressive appearing contraptions are used to bamboozle a credulous public out of millions of dollars each year, will also be told next month, as well as the story of how meterologists are using new radio devices to enable them to do something about the weather.

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Chips from the Editor's Workbench

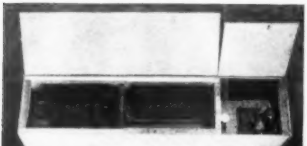
Send in photos of your completed workshop projects. Each month Mechanix Illustrated awards a first prize of $5 for the best photo and letter received by this department and prizes of $3 each for all other photos and letters used.

Charles Kenney is shown with the graceful 10-foot pusher-type gas-powered model airplane he built from MI plans in the August-September issues.

Builders of gas-powered model airplanes will be intrigued by the photo sent in by Charles Kenney, of Newark, N. J. Winning a $5 prize for Charles, the photo shows the pusher-type XP-3 gas model which he built from plans that appeared in the August and September (1938) issues of MI. Charles says he has flown the model at several contests and it has always attracted the attention and praise of contestants and judges alike. Well, it SHOULD, for it is one of the most interesting models I have ever seen and I've seen many.

***

It has been a long time since MI featured a department that met with such instantaneous success as the Photography Section. Photos of photography projects completed by readers have flooded the Workbench, one of the most recent being that of a cabinet dryer built by Newell Probert, of Seattle, Wash., who was awarded a $3 prize. The dryer is made from plywood and is four feet long with a 12-inch width and depth. A small fan blows the heat from a 660-Watt heating element down through the cabinet, the heated air passing over 20 ferrotype plates. Built at a cost of $3.25, the dryer will dry prints in less than 10 minutes, says proud craftsman Newell.



A real photography enthusiast, Newell Probert built this cabinet dryer at a cost of $3.25. It dries prints in 10 minutes.

***

I'm sure that most MI readers are familiar with the soap box racers that have become so popular within the past few years. Well, the thing to do with the "gravity-powered" cars when you outgrow them is to power them with an old washing machine motor. At least that's what Allan Kreig, of Coeur d'Alene, Idaho, did and he reports that the conversion works out very satisfactorily. Allan fitted the racer with a three-speed transmission and claims it travels at a speed of 20 m.p.h.

Having outgrown his "gravity-powered" soapbox racer, Allan Krieg equipped it with an old washing machine motor, thus converting it into one of the ever popular midget racers.

[*Continued on page* 14]

A Simple Recipe for Inventive Success

PROBABLY the simplest recipe for inventive success would be this: First, a practical, useful invention; second, a good, strong Patent; third, a buyer or a market. The inventor needs all three to get anywhere. Lacking any one, he is likely to get nowhere. The recipe is simple. Working it out isn't so simple. That is why inventors—and others inventively inclined—have found the two books shown here so helpful. We've gone into each part of the recipe carefully. *Exactly what is an invention?* We tell you. *What is a strong Patent?* We tell you. *How can I go about finding a buyer?* We tell you.

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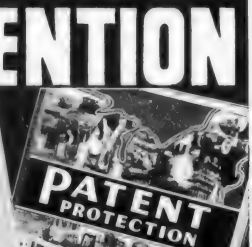

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Editor's Workbench Chips

[*Continued from page 12*]

This pretty miss is demonstrating the powered scooter constructed by Russell Naeve. Should have two seats, Russ!

Judging from Allan's size, I'd say that he was in danger of outgrowing the powered midget's cockpit. How about it, Allan? Maybe the $3 award I'm sending you will help buy parts for the construction of a bigger racer.

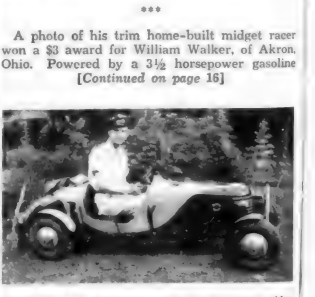
***

Powered scooters continue to rate highly with MI craftsmen and a photo sent in by Russell Naeve, of Ogden, Iowa, shows one he built from half-inch welded gas pipe. Powered by a converted washing machine motor, Russell's scooter attains a speed of 20 m.p.h. Okay, Russ, I'm sending you a $3 prize and I hope you'll treat the young lady who occupys the driver's seat.

***

A photo of his trim home-built midget racer won a $3 award for William Walker, of Akron, Ohio. Powered by a 3½ horsepower gasoline

[*Continued on page 16*]



Powered by a 3½ horsepower motor, this trim looking midget racer carries builder William Walker at speeds up to 45 m.p.h.

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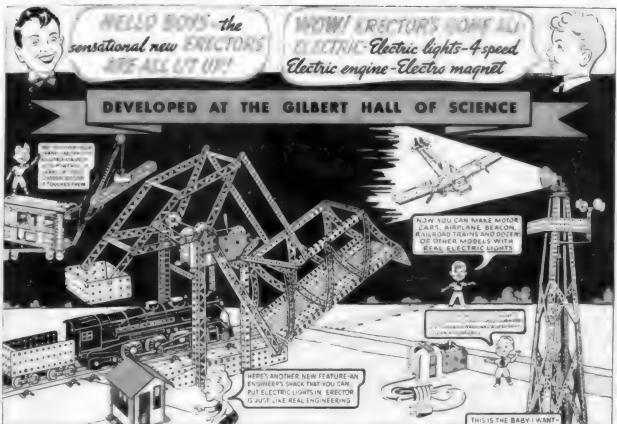

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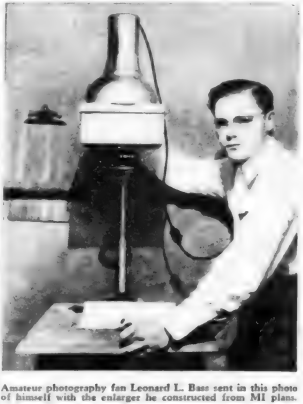
Editor's Workbench Chips

[*Continued from page 14*]



Amateur photography fan Leonard L. Bass sent in this photo of himself with the enlarger he constructed from MI plans.

engine, the tiny car speeds along at 45 m.p.h. and averages 40 miles per gallon of gas, according to Bill. Three forward speeds, an electric starter and front mud guards that turn with the wheels are features of the racer which has a wheel base of 60 inches and a tread of 30½ inches. It's a nice looking job, Bill. Good luck with it.

***

Another amateur photography fan who sent in a photo that was awarded $3 is Leonard L. Bass of New York, N. Y. Leonard built an enlarger from plans that appeared in MI and says that the results have been excellent. Nice work, Leonard, and I'm glad you posed with the enlarger as we like to feature photos of projects with the builders standing by. Thanks, also, for your kind words about MI. We are glad to know that you find the magazine "swell" every month.

***

Be sure you read the details of the big "Men With Wings" aviation contest which appear on pages 78-79. The contest features 23 excellent prizes consisting of miniature gasoline motors, gas model plane kits and a round-trip airline flight to Hollywood, Calif.

[*Continued on page 18*]

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Editor's Workbench Chips

[*Continued from page 16*]

Flights of three to five minutes are reported for this "Cloud Hooker" rubber-powered model airplane which John Vlahakes built from plans that appeared in April, 1937.

Although gas-powered model airplanes have become very popular during the past year, the majority of modelers are still building rubber-powered types. One of the best cabin endurance types ever featured in MI was the "Cloud Hooker" (April, 1937 issue.) John Vlahakes of Birmingham, Ala., built a model from the plans and says that it has repeatedly produced flights of from three to five minutes duration. Your model looks good, John. Watch for MI's $3 check in the mail.

***

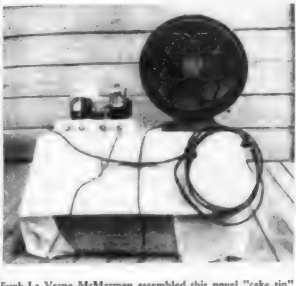
Photos of enlargers, driers, and numerous other photography gadgets have been coming in to the Workbench in ever increasing numbers lately. One of the photos received was sent in by Harold Nogle of Port Arthur, Texas, and shows a film tank agitator he built from plans in the July, 1938 issue. Harold used parts from an old Meccano set, an old clock, Bakelite uprights and wooden blocks to build the agitator. Such ingenuity should be recognized, say I, so I'm sending Harold a $3 award.

[*Continued on page 21*]

Following plans that appeared in MI (July 1938), Harold Nogle built this photographic film tank agitator.

Editor's Workbench Chips

[*Continued from page 18*]



Frank La Verne McMarman assembled this novel "cake tin" all-electric radio amplifier, following plans in a 1935 issue.

According to official reports there are about 55,000 licensed radio amateurs in the United States, with probably four times as many "serious" short-wave listeners. Judging from the letters and photos received by the Workbench, many of these radio fans are readers of MI. For instance there's Frank La Verne McMarman, who sent in the photo of the "cake tin" all-electric amplifier which he constructed from plans that appeared in the August, 1935 issue. Frank says he has used MI plans for years and has always had satisfactory results. Unfortunately, Frank, you neglected to send your street address, so I'll have to hold MI's award of $3 for you until you correspond with me again.

While on the subject of radio, the January issue will include complete plans for the construction of a receiver that we think is just about the best we have ever heard. Designed for listeners who are more than just particular about how their set sounds, this outfit really gives high-fidelity reproduction. The best part of the receiver is its simplicity. Anyone can build it and the cost is less than you would expect.

It uses the latest tubes and a circuit that has had all the "bugs" ironed out so that when you build it, it will work! Everyone who has heard it is surprised that a radio of such unusually high-fidelity reproduction, can be built for such low cost. It's not very often that we become excited about a radio set, but when we heard this one, we knew that MI readers, and the radio fans in particular, would want to build this set. Don't miss the January issue, for complete details.

[*Continued on page 31*]

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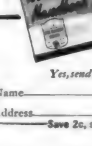

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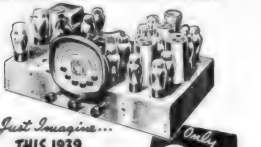

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Harvard Scientists Analyze Tones Of Old, New Violins

Tomorrow's violin makers, turning out richtoned instruments on a quantity basis, may be able to make violins rivaling famous old Stradivarius and other instruments as the result of a study under way at Harvard University in Cambridge, Mass.

Prof. Frederick A. Saunders, in charge of a research group comparing the behavior of 30 instruments ranging from a five-dollar fiddle to some of the finest violins known to the world of music, has found that inexpensive modern violins at some notes have approximately the same tone quality as the averaged responses of several Stradivarius violins.

The discovery offers considerable hope that scientific design may enable the construction of relatively cheap instruments with the fine tones of the old masters' violins.

The beautiful, vibrant tones of the world's most precious violins are being analyzed and compared with the harsher notes of the typical pawnshop fiddle in the research project.

Dr. Saunders has also found a striking similarity between the averaged responses of five Strads and five other fine old Italian instruments made by P. Guarnerius, J. Guarnerius, Stainer, Guadagnini and Gagliano. Further research is expected to shed light on whether there is a unique "Italian tone" which many musicians believe to be characteristic of violins by Stradivarius and other noted makers.

Tests are also in progress to discover any physical changes in violins which might explain the raw tone found in many new instruments and which disappears after a few months of playing. Prof. Saunders believes it may be due to the tight gluing of the wood which prevents the instrument from vibrating freely. This glue loosens with use, he believes.

Key apparatus in the tone analysis research is a "sound camera" which automatically makes a picture of tones up to 10,000 cycles, well beyond the upper limit of the musical scale. While the ear hears a musical note as a vibration at one particular frequency, the note is actually the result of simultaneous vibrations at several frequencies. The sound analyzer, built by Dr. Harry H. Hall, with the cooperation of Prof. Frederick V. Hunt and Prof. George W. Pierce, separates these partial tones and measures their relative intensities.

Tests are also under way concerning the contribution to the violin tone of some of the body parts, especially the bridge and the internal air mass.

Virtually none of the tone comes from the strings, but chiefly from the reactions of the complex vibrating system of the violin body and the internal air mass to the string vibrations.

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Hobby Crafts To Be Shown At Golden Gate Exposition

Hobby crafts will come into their own at the 1939 Golden Gate International Exposition on San Francisco Bay.

At the $50,000,000 World's Fair of the West an unique exhibit of all the tools used in the various home crafts will be displayed. Millions of visitors will be made acquainted with the highly specialized tools and equipment required by amateur craftsmen. Individual tool displays of leather working, wood working, miniatures and models of boats, trains, locomotives and airplanes are planned.

A display of small hand metal working tools promises to be popular, particularly among women who are fast becoming interested in this fascinating craft. Another class of home craft which is rapidly developing is amateur lapidary work. There have been dozens of societies formed all over the country that make a hobby of cutting and polishing stones which the members have actually found. The exhibit will include a complete display of the tools of the lapidist and jeweler both amateur and professional. C. W. Marwedel, representing more than two thousand manufacturers, will install the display.

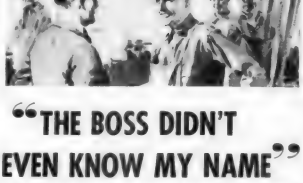
Harvard Scientists Develop Cosmic Ray Counter

A device enabling the fastest and most accurate counts ever made of cosmic rays and other particle radiation has been developed in Harvard University's physics laboratories by Dr. E. C. Stevenson, instructor of physics, and Dr. Ivan A. Getting, junior fellow.

With the new instrument, technically known as a scaling circuit, random electrical impulses coming only a fifty-thousandth of a second apart can be distinguished and counted. The circuit is so stable counts can be made at these terrific speeds for months on end without any effective changes in the equipment

The new scaling circuit does not receive cosmic rays or other particle radiations directly, Harvard physicists pointed out, but rather the electrical discharges produced by these particles in a standard Geiger counter. This is a long glass tube filled with gas at a critical electric equilibrium. A particle passing through the tube upsets this equilibrium to produce an electric discharge.

These impulses are fed into one end of the scaling circuit, where their number is divided by two, four, eight, sixteen or thirty-two, depending on how the apparatus is adjusted. Thus the impulses are scaled down sufficiently to permit their being counted by a plain mechanical counter attached to the circuit outlet.



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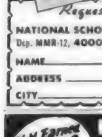

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Few Real Meteorites Found, Geologist Declares

Remember that funny rock you found last year? Looked like a meteorite, didn't it? Well, the chances are just 2,000 to 1 that it isn't according to figures collected by Dr. E. P. Henderson, curator of the Smithsonian Institution's meteorite collection in Washington, D. C.

Judging from past averages, he expects to receive about 2,000 "meteorite" samples during the coming year, of which only one or two will actually be meteorites. The rest will be assorted mineral junk, mostly ordinary garden variety stones.

Iron cannonballs, after a few generations of rusting, could easily be mistaken for meteorites, but, according to Dr. Henderson, it is just as possible for an iron meteorite to be mistaken for a rusted cannonball. Many things of definite terrestrial origin are sent to the Smithsonian as meteroite samples, including a stomach stone from a cow.

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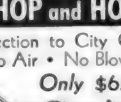

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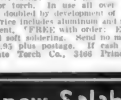

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Of MECHANIX ILLUSTRATED, published monthly at Louisville, Kentucky, for October 1, 1936.

State of Connecticut }
County of Fairfield } ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Roger Fawcett, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the MECHANIX ILLUSTRATED and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, W. H. Fawcett, Greenwich, Conn.; Editor, Robert Hertzberg, New York; Managing Editor, Ralph Daigh, New York, New York; Business Manager, Roger Fawcett, Larchmont, New York.

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Weapon Shoots Balls Of Fire

A new type of gun, which has been invented by Delter Webster, of Eugene, Oregon, shoots balls of fire instead of bullets. The balls consist of compressed powder pellets which burst into flame as they leave the muzzle of the gun. The new weapon is said to have military possibilities, particularly as an anti-aircraft defense weapon if produced in guns of large caliber.

Clock Controlled By Signals Received By Radio Set

A radio clock, built either as an auxiliary or as an integral part of an otherwise ordinary radio receiver, and controlled by signals sent out from the broadcasting station along with the regular program, has been patented by a New Jersey inventor. Designed by Walter van Braam Roberts of Princeton, the device is said to tell time to the nearest five minutes, but can be modified to tell time to the nearest minute and second.

Controlled by a master clock at the radio station, signals are sent out at the selected interval. The signals consist of low frequency modulations, below the range audible to the human ear. Received by the receiver at the same time the regular program is coming in, the signals cause reeds to vibrate. The reeds in turn permit to pass or do not permit to pass a beam of light directed toward a screen. The position of the light beam indicates the time.

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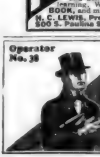

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Editor's Workbench Chips

[Continued from page 21]

One of the best looking and well equipped amateur radio stations, according to reader John Sullivan, is that shown above. It is operated by John's friend, James Pepper.

Feeling that his friend James Pepper had assembled such an excellent amateur radio station that a picture of it merited space in MI, John Sullivan, of Niagara Falls, N. Y., sent in the photograph above, thereby earning a $3 award. The transmitter is a 1000-watt phone and the rig consists of a heavy duty power supply, modulator, RF oscillator, RF amplifier and antenna tuner. John neglected to state what Pepper's station call letters are, but I'm asking him to send them in, so if any of you "hams" want to contact him, send in your request for the call letters.

***

Workshop fans who would like to try something new in the way of craftsmanship will enjoy the article, explaining how to do Plastic Wood inlaying, in the January issue of MECHANIX ILLUSTRATED. This work is not difficult, and after you have read the directions, you certainly will want to try it.—*The Editor.*

Cover to cover it's brand new. New 1939 Lafayette Radios, 60 new models . . . every one a streamlined beauty and all priced within easy reach. Complete list of nationally advertised radio parts and equipment. Sensational new television kit, plus the biggest selection of build-them-yourself radio kits. New photography section solid-packed with real values. 188 pages of standout buys! Send for your **FREE** copy. It's today's buying—*and saving*—guide.

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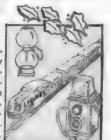

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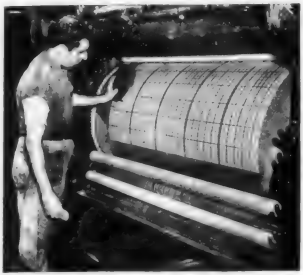

When the City of New York decided to place a tax on the sales of cigarettes, it was necessary to issue millions of special tiny stamps which could be affixed to the glossy cigarette packages and special machines were required for the job. In the photograph above, a pressman is shown cleaning the plate from which the first part of the stamp design is printed. In addition to printing the stamps, the machine applies a gummed adhesive coating to the back of each stamp.

Humidity May Hurt Walls

ARTIFICIAL humidification of the air should not be tried in buildings of ordinary construction during the winter as it may result in serious damage to the building, C. P. Yaglou warns in a recent issue of the Journal of the American Medical Association. Normal humidity is all they can safely carry.

Discussing air conditioning, Mr. Yaglou reports that artificially high humidity may result in the condensation of moisture on cold walls of the building to such an extent that the moisture will seep through. Not only can it damage plaster and wood construction and loosen wall paper, but it may also get into cracks in the outside sheathing. If that happens, the sheathing may be damaged during the first frost, for water expands when it freezes.

Reason for the condensation of water on cold walls is the fact that air can hold larger amounts of water vapor when it is at a higher temperature. Warm air from the center of a room coming into contact with a cold wall or window deposits the moisture it cannot keep when it is cooled.

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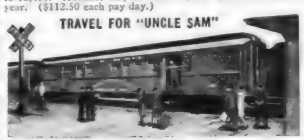

3 Days On—3 Days Off—Full Pay

Railway Postal Clerks on long runs usually work 3 days and have 3 days off duty or in the same proportion. During this off duty their pay continues just as though they were working. They travel on a pass when on business. When they grow old, they are retired with a pension.

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SOUTH BEND *Precision* LATHES

Vol. XXI No. 2 Publisher December 1938

MECHANIX ILLUSTRATED

Johnny Peterson in his midget racer powered with an engine of motorcycle design clocked at 121 m.p.h.

THRILLS and SPILLS with MIDGET RACERS

Midget racers are motordom's contribution to scientific simplicity. Impish in design, they streak down the tracks at 120 m. p. h.; provide thrills and spills to an excited, roaring crowd.

by Stanley Gerstin

ONE hundred and twenty miles an hour in an oversize kiddy car!

With a coffee grinding motor and cracker box frame these mites of automotive ingenuity roar around the tracks with the same thundering defiance of time and speed as the mightier 350-mile-an-hour powerhouses on wheels of John Cobb and Capt. George Eyston.

Listening to the pint-size engines turn up from a sullen whine to a mighty roar as the midgets flash across the line makes the blood tingle, for midget racing has the knack of getting into a man's blood. As the whir of wheels

fills the air, 10,000 pairs of eyes stalk the streaking darts as though watching death itself circle the track. This is something more than sport. This is something that speeds the pulse and holds you in gripping suspense as you watch in goggle-eyed awe.

This is midget racing. Seven hundred and fifty pounds of blood and iron; of pumping cylinders and turning wheels; of sweaty drivers overflowing from tiny cockpits; of man's ingenuity packed in a thundering crate of metal; of smoke and blinding speed!

This is motordom's contribution to scientific simplicity. Impish in design, stripped of foot brake and clutch, of starter and other gadgets essential to stock cars as well as to other racers, the midgets streak down the straightaways at 70 and 80 miles an hour and take the turns at 40 and 50 bringing the crowd to its feet.

Speed, good driving and the breaks make a race—and sometimes freakish luck such as that of Pete Naccarato. Pete was roaring around the Gilmore track, in Los Angeles, the wheels of his racer just an inch behind the leading car on the turn. As the cars skidded into the straightaway, Pete opened the throttle to pass. At this moment the leading car hit the fence, bounced off, and as Pete swung wide, he was nicked by the skidding car which sent him spinning. Pete was thrown clear but on rolled his driverless car over and over, crossing the finish line just ahead of the other racer with Pete chasing it like a runaway horse. The judges ruled that since Pete's car was the first to cross the finish line, he was entitled to first place although not at the wheel at the time!

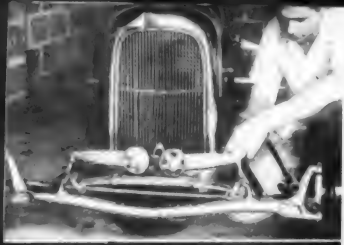
Freak accidents, like Pete's are frequent occurrences. Johnny Peterson, one of the leading drivers on the Eastern tracks this year rode half way round a track on the back of another racer. Johnny was trying to pass on a turn but the car in front clung to the pole. As Johnny squeezed in, he hit the fence, bounced into the other car and his front wheels rolled up over its hood. The two cars clung together for a considerable distance before breaking apart and spilling the drivers. Such spills and thrills of midget racing provide the stuff that makes the crowd roar.

If you wonder what makes the mighty midgets go, look under the hood of these little racers. What you see is a high-powered

The midgets drift into the turns with throttles open and motors roaring; sometimes come out of them with a burst of speed; sometimes pile up in a heap.

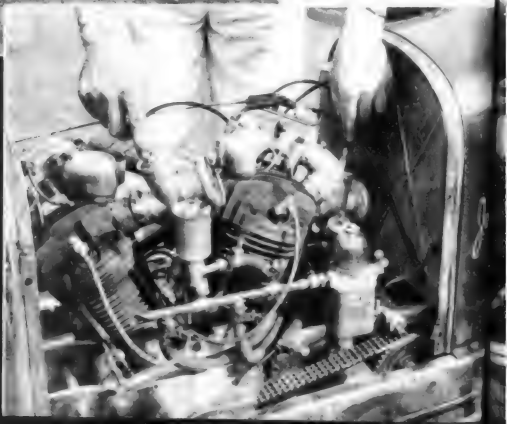
outboard or an engine lifted from a motorcycle, or a small V8 (still too big for the midgets so that the engine spills over the sides) or perhaps some foreign-made contraption turning up to 6,000 or 7,000 r.p.m., and developing 50 to 80 horsepower. They are usually gearless and clutchless with nothing more than an emergency hand brake used only to affect a skid on the turns, and a dog clutch to throw the car in high to start things moving. And can they move!

"Texas" Joe Garson roared down a Detroit track at 124 miles an hour driving a midget with an outboard motor. Johnny Peterson thundered across the finish line and was clocked at 121 miles an hour. On the shorter runs such as the ⅛ mile track at Roosevelt raceway in Long Island,



Every driver has his own ideas about how a midget should be built. Jack Vanis [above] swears by his tubular axle.

On the other hand Bob Meyers disposed of the front axle and uses a spring suspension, as shown. This permits the wheels to pitch on turns, permitting greater speed [above].

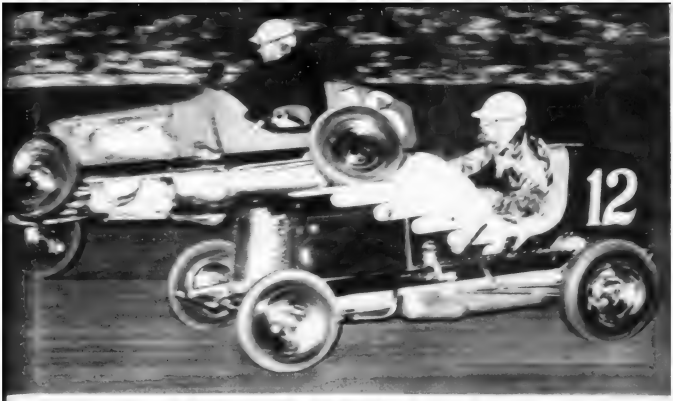


Johnny Peterson's racer is powered by an 80 hp. J. A. P. equipped with 2 carburetors. The engine winds up to a terrific speed. It is overhauled every 12 races.

N. Y., the midgets go into the turns at 70 miles an hour. They take the turns broadside so that they face in the right direction as they come out of the turn. The throttle is opened wide, the motors roar deafeningly and the midget marvels leap into the wind.

Because of their light weight, the midgets are better handled on flat turns, being unable to cling to banked curves like the heavier cars. Taking the turns is a test of the drivers nerve and skill. On reaching the turn the emergency brake is pulled up hard and dropped immediately, to slow the car. Then the wheel is swung hard left (for left turns) and this throws the rear around so that the car faces the infield. At the same moment the driver steps on the gas, giving power to the rear wheels. This holds the car to the ground and the midget literally drifts around the turn. If the rear swings too much, the driver lets up on the gas. If not enough, he opens the throttle more. If you try this stunt with a stock car, be sure to wear a crash helmet!

Pick-up is the main thing with midgets on a small track. Top speed is of secondary importance. A driver can't go anywhere in

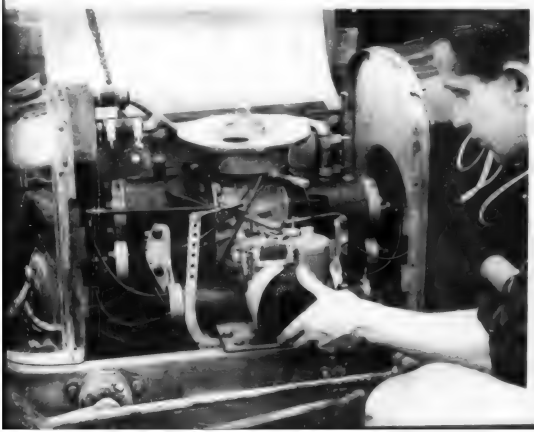


This shows the beginning of a bad spill as the driver in No. 16 rides his rear wheels over the hood of No. 12.

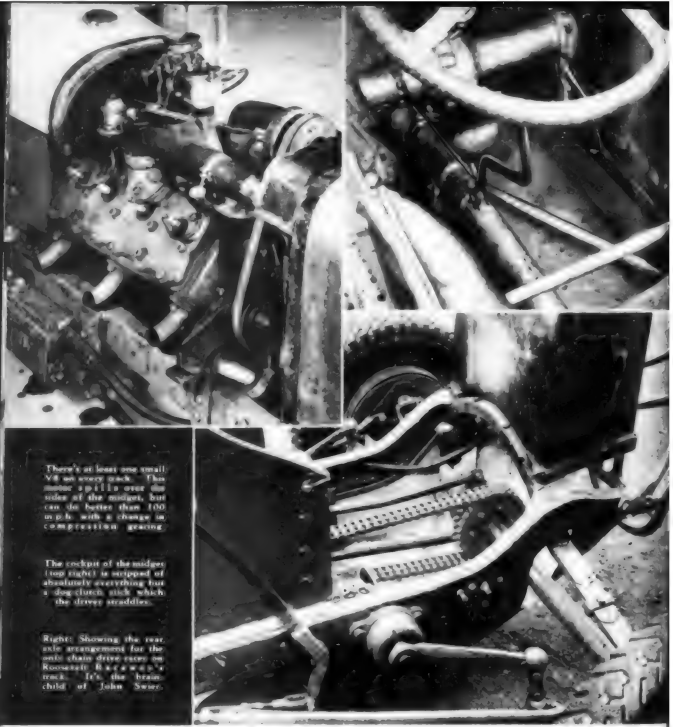
a midget when the straightaway is only 400 feet long if he has slow pick-up, even though his top speed may be terrific. The winners are usually those who go into the turns first, and come out of them most quickly and spurt down the short track to drift into the turn again.

Joe Garson and Ernie Gesel, leading Eastern point scorers, do it with 60 horsepower outboards. Johnny Peterson, who is no man's stooge on the raceways burns up the tracks with an 80 horsepower J. A. P. (specially built English motorcycle engine designed for racing). Garson's and Gesel's engines wind up terrifically; have tremendous top speed, as well as pick-up, and on a straightaway these drivers make the others seem to be standing still.

But the presence of Gesel, Garson and Peterson; of Jimmy Schneider, Duke Nolin



Next to the powerful Offenhausers, an outboard motor is considered the fastest on the midget race tracks. They wind up terrifically, have tremendous top speed and pick-up. This 60 hp. outboard in Bob Meyers' racer keeps him in the MONEY.



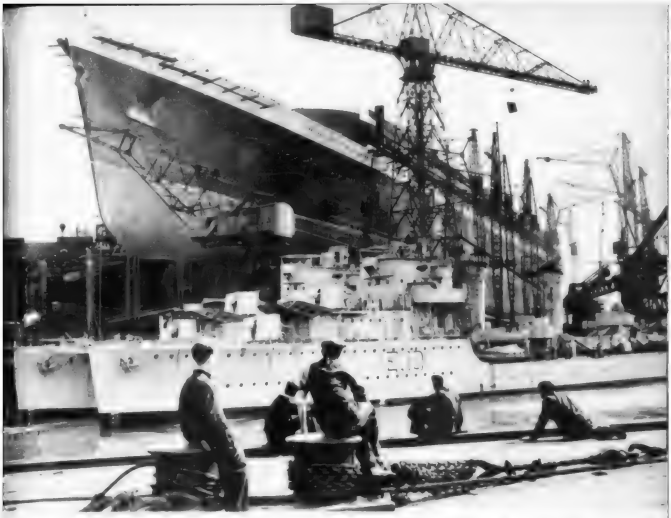
There's at least one small V-8 on every pack. This motor, split over the sides of the midget, but can do better than 100 m.p.h. with a change in compression gearing.

The cockpit of the midget (top right) is stripped of absolutely everything but a dog-clutch stick which the driver straddles.

Right: Showing the rear axle arrangement for the anti-chain drive razz on Roosevelt Raceway's track. It's the brain-child of John Swier.

or Ronald Householder with their outboards and J. A. P.'s doesn't discourage the hundreds of young racers who someday hope to be at the top. John Swier, for instance, who drives a 90 horsepower motorcycle engine with a chain drive, keeps up with the best of them. His is probably the only chain drive on the Eastern tracks and he claims for it good pick-up and plenty of power on the turns. It also saves weight, he claims. What his fellow track mates think of the chain drive isn't fit to print but it's just this difference of opinion that makes midget racing what it is. For instance, Jack Yisitis (pronounced Yes-it-is) swears by his Vanlert 16-valve, single-overhead, 97 cu. in., 100 horsepower engine which he claims has been clocked at 130 miles an hour, unofficially. Among other things, he also swears by his tubular front axle and elbow-type dampers. Swier, on the other hand, took out the front axle and uses eliptic springs to which the wheels are suspended to pitch in or out, depending on which way he is turning. Swier claims he can take turns better with this arrangement and as long as he continues to finish up among the leaders, he'll stick to his story.

[*Continued on page* 118]



New English Ocean Liner Will Be World's Largest

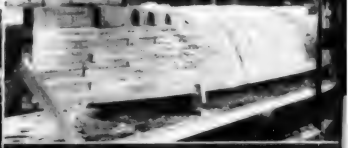
DWARFING the destroyers in the foreground, the hull of the Cunard White Star Line's newly projected passenger ship *Queen Elizabeth* makes an imposing picture in a shipbuilder's yard in Scotland. When completed in 1940, the new vessel will be the world's largest with a length of 1,030 feet, $10\frac{1}{2}$ feet longer than the *Queen Mary*.

Portable Darkroom Is Practical Photo Aid

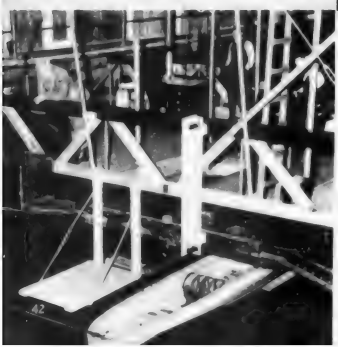
CONTAINING 14 items including trays for developing and fixing, negative and paper holder, etc., a newly developed portable "darkroom" outfit enables a photographer to do darkroom work anywhere in broad daylight. The "darkroom" consists of a compact box fitted with flexible light-proof sleeves through which the user can insert his hands to get at the materials within. By looking through a glass in top, the photographer sees his hands, trays, etc.

Left—View of the interior of the Naval Experimental Basin in Washington, D. C., showing wooden scale model battleships in various stages of construction. Below—A huge mechanically operated plane is used to smooth down the outer hull surface of the miniature warships. The workman controls the scraper.

Shown below is the Experimental Basin's mammoth towing machine, which is used to move the scale model hulls through the water at varying testing speeds.



Below—The fully smoothed hulls are lowered into a water basin in which every type of sea condition can be simulated to test the hull's reaction to waves.

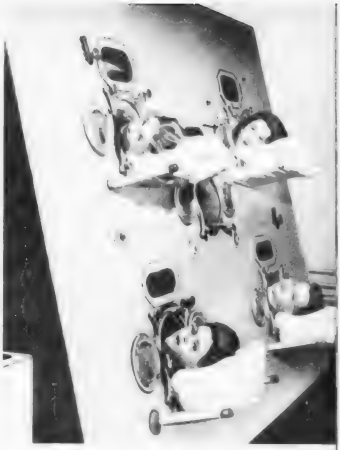


Building TOMORROW'S WARSHIPS In Miniature

THE steel monsters that make up the fighting fleet of Uncle Sam's Navy are the result of painstaking research by designers, engineers, draftsmen, ordnance experts and scientists. Long before plans are approved for an addition to the fleet, the blueprints of the new vessel are drawn up, improvements and changes carefully thought out with due regard not only for the effect on the vessel itself, but also with an eye on its potential usefulness as a permanent addition to battle efficiency. Once the plans have been approved, skilled carpenters carefully create scale models in wood, so that scientific tests can determine exactly how a fully developed steel ship will handle when constructed.

Gigantic Sieve Clears River

REMOVING silt and debris from Colorado River water on the California side of Imperial Dam is the purpose of the gigantic iron sieve-like structure shown above. Relieved of its great burden of silt, the water then begins an 80-mile journey to irrigate the Imperial Valley in California. Construction of the dam was completed last July.



"Iron Lung" Goes Quadruple

INSTALLED at the Children's Hospital in Boston, Mass., a newly developed "iron lung" chamber accommodates four patients at one time, as shown above. Because of its special construction only one air pressure unit is required to operate the four respirator compartments of the chamber, thus reducing the cost of treatment per patient.

Negative Viewer Aids Photography Fans

AN ATTRACTIVE film slide viewer which has been placed on the market by a well known optical firm enables users of miniature cameras to study negatives for enlarging possibilities or to exhibit them to best advantage. The ground glass diffusing screen of the viewer permits the showing of all popular miniature sizes, in black and white, or colored positives. Operating on 110-volt A.C. or D.C. current, the viewer has a well ventilated housing and uses an ordinary 15-watt bulb.

GOLDBEATING—A Passing Art

Machinery is used only at the start of the goldbeating process. The gold is flattened into ribbon form between rollers of a press, as shown in above photo.

Goldbeater's skin, used to cover the gold leaf during the beating process, must be conditioned by subjection to frigh hammer blows for 40 minutes before use (above).

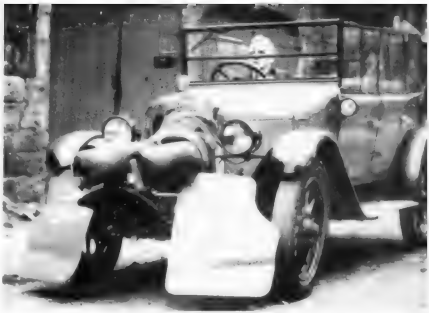
GOLDBEATING, a hand process whereby one ounce of pure gold can be beaten into enough leaf of a 1/282,000-inch thickness to cover an area of 85 square feet, is gradually becoming a passing art. Limited demand for pure gold leaf, the development of a cheap gilt substitute, and the fact that actual beating of the leaf is something that cannot be done satisfactorily mechanically, thus increasing production costs, have sounded the death knell of the industry.

In producing gold leaf, machinery is used only at the start of the process when the pure gold is run between the rollers of a powerful press which converts it into ribbons 30 feet long. Each ribbon is cut up into small flat squares which are then placed between sheets of goldbeater's skin (made from the outside membranes of the large intestine of an ox) and pounded by hand for hours until leaf of the desired thickness is obtained.

Above—Gold leaf, placed between sheets of goldbeater's skin, is hand-hammered for 8 hours until it is about 1/282,000 of an inch in thickness, as shown at right.

New Auto Safeguard Protects Pedestrians

THIS automatic safeguard for use on automobiles, to protect pedestrians, is the invention of David Keith, of Birkenhead, Cheshire, England. When the car strikes a person, the device tilts back, lifting the person onto the car instead of running over him. The photograph shows a dummy being lifted off the road in a test. The invention is to be given thorough tests by the Ministry of Transport.



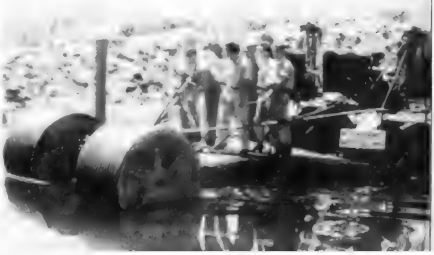
MI Boat Starts On Trip To South Seas

BUILT from MI plans of the 30-foot ketch *Tahiti*, the *Nahrah* now is on its way toward the Marquesas, 4,500 miles away from its home port, San Francisco. The craft was built by Arved Littchen, and its itinerary, to take one to three years, includes the Lower Tuomotu Archipeligo, Monga Reva, Society Islands, and Samoa, including all the French Polynesia.

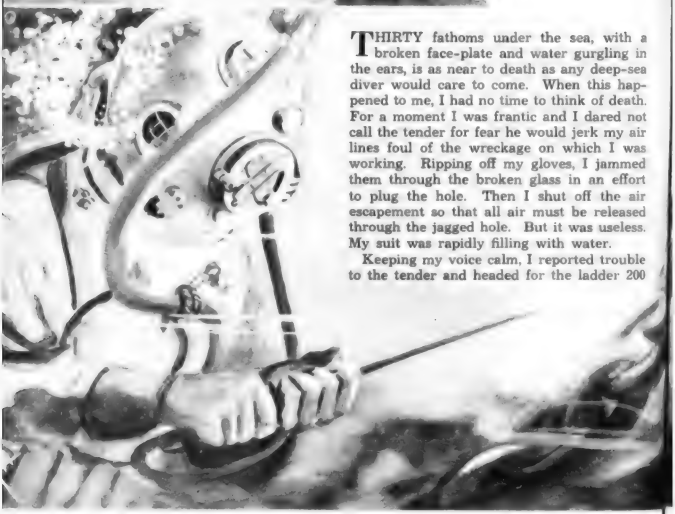
Besides Skipper Littchen the crew consists of Ted Martine and Joe Lais. The *Nahrah* carries two tons of supplies.

Swamp Buggy Uses Airplane Propellers

THIS "marsh buggy" or "swampmobile" travels on land or water with equal ease and receives its motive power from two airplane propellers of the pusher type. Carrying a crew and equipment, the "marsh buggy" travels along the swamp bank dropping off pipes, etc., at the correct points. On land, the four large tanks act as wheels. A top speed of thirty miles an hour is claimed for the craft.



Left: Two salvage tugs above a sunken steamer lowering a diver to inspect the ill-fated ship.



THIRTY fathoms under the sea, with a broken face-plate and water gurgling in the ears, is as near to death as any deep-sea diver would care to come. When this happened to me, I had no time to think of death. For a moment I was frantic and I dared not call the tender for fear he would jerk my air lines foul of the wreckage on which I was working. Ripping off my gloves, I jammed them through the broken glass in an effort to plug the hole. Then I shut off the air escapement so that all air must be released through the jagged hole. But it was useless. My suit was rapidly filling with water.

Keeping my voice calm, I reported trouble to the tender and headed for the ladder 200

DARING DEATH for

Right: Tanker aground and breaking up in the heavy seas. Divers salvage its valuables.

"I have covered the ocean bottom from Alaska to Mexico," says

Charles E. Smale

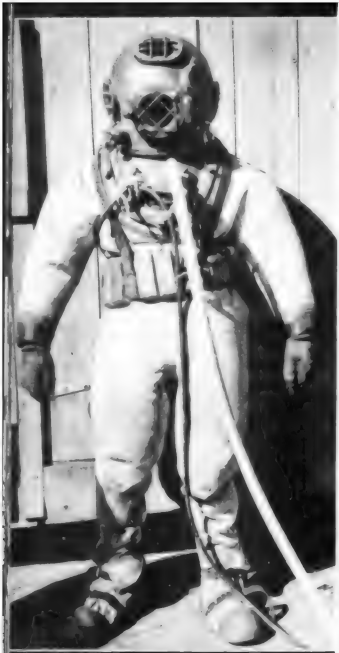
who tells of his experience 30 fathoms under the Pacific.

feet away. I remember reaching the bottom and starting up, rapidly losing consciousness. The water-filled suit lost its buoyancy and confined my movements like an iron straightjacket.

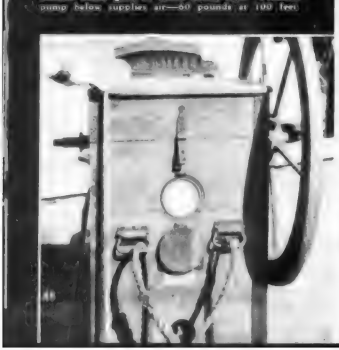
As I neared the top, the water in the suit rose over my mouth and nose. Searing pains shot through my chest from suffocation. My movements were but mechanical as the energy drained from my spent muscles. But with a final burst, I reached the deck, aided by a boost from the tender, and lay there, water-logged, just dimly conscious.

That was my first crucial experience as a deep-sea diver. Since then I have spent more than 10,000 hours under water. I have seen silver coin piled knee deep on the bottom of a sunken gambling ship. I have pulled bodies from airplanes 150 feet under the surface. I have dredged for gold on river bottoms, salvaged steamers, worked on underwater construction and have worked as a "double"

UNDERWATER GOLD



The diver above is ready for a plunge to the ocean bottom where gold or death awaits him. Pressure pump below supplies air—60 pounds at 100 feet



in seven motion pictures. I have suffered the paralysis of the "bends" and I have seen men writhing on the deck, spurting blood from ears and nose as a result of a "squeeze." But I find deep-sea diving the most fascinating work in the world.

It is also probably one of the most dangerous occupations. I've often felt my ear drums pop outward when lowered too quickly into deep water without proper regulation of inside air pressure. And inexperienced divers, shooting to the bottom without proper adjustment of air, suddenly find their circulation cut off below the protection of the helmet and breastplate, the intense pressure of the cold water forcing their blood into the chest and head. Sometimes quick action saves them; more often the blood bursts from mouth, nose, and ears, with almost instant death resulting. This condition is known, in diver's parlence, as a "squeeze."

Once on the bottom, the air pressure is increased to a point where it lifts the weight of the gear from the body, reducing the weight of the body in the water to about 40 pounds. It is this pressure, plus sudden decompression, that causes the dreaded bends.

"Bends" are the direct result of too much nitrogen in the blood-stream. When working at a depth of 100 feet, 50 pounds of pressure are required to force air down to the diver; ten more pounds are required so that the diver can breathe. Breathing under this pressure naturally forces an excess supply of oxygen and nitrogen into the lungs. The lungs can take care of the oxygen, but the nitrogen escapes to form a tiny gas bubble in the blood-stream.

Under ordinary decompression, it requires 45 minutes to raise a diver who has been working for an hour in 100 feet of water. Half of this time is taken on a resting platform at 50 feet, and the constant exercise of the diver on the way up drives off the nitrogen. But when the decompression is taken too fast, the size of the bubble increases as the pressure lessens, finally attaining a large enough proportion to stick in an artery, thus cutting off the blood supply and causing paralysis. If it lodges in the heart, it means death.

When decompression chambers are not included in the equipment, a man with the bends is immediately returned to the water under the custody of another diver until he revives.

I suffered the bends once—with neither decompression chamber nor diver available. They pulled me to the deck, and my legs crumpled under me. I lay there, paralyzed

from the waist down. I could hear them planning to throw me back—to take a chance on regulating my air supply until I recovered. I felt that death had caught up to me at last. I protested weakly, more weakly, and then fainted. I awoke on the floor of the ocean. Spent? Yes—but happy and thankful.

It's things like that which cut down the average man's length of time in actual diving service. There are about 100 divers in the United States; few of them have seen over five years service. A flat rate of pay amounting to between two and three hundred dollars per month with a bonus of seven dollars per dive is not enough to keep most men in the business when life balances on the other side of the scale. It is the variety and thrill that keeps me in the service.

Doing salvage work, I have covered the Pacific coast from Alaska to Mexico—perhaps diving 20 feet to raise a tug in San Francisco one day, then by plane to Seattle to dive 150 feet to patch up an ocean liner on the next.

The larger liners present difficulties. As a rule, we usually find them sunk in deep water with jagged holes in their sides that must be patched before they can be raised. To pull a diver down to their depths, modern diving equipment is necessary. This gear weighs about 240 pounds and usually consists of a **heavy spun-copper helmet and breastplate, a canvas suit, an 80-pound belt, and two 14-pound sandals for the feet. When it is necessary to carry tools, a pair of overalls with pockets, known as "chafing pants," is worn.**

A downward trip into 150 feet of water re-

Above: Getting into a diving suit is a tough job. Four men are needed to handle the suit and life lines.

Right: Deep sea divers have learned to use electric torches, grappling irons and other mechanical tools to clear away steel doors behind which may lie glittering gold, silver or other valuables.

quires about five minutes, oftentimes more. As the diver slides down the line, he gradually increases the air pressure within the suit to offset the increased outer pressure of the deeper water.

The rush of air into the suit is controlled from a valve at the waist; stale air is forced out through a spring-set escapement valve in the rear of the helmet. Air escapement can be set in emergencies by pressure of the diver's chin against a button conveniently located inside the helmet.

Dressed in this weird outfit, the diver pushes his way along the bottom of the ocean with an electric cutting torch to cut smooth the jagged edges of the hole torn in the ill-fated ship. Inch by inch the torch cuts into the heavy steel. The heat of the electricity creates a fog of steam around the flame as it cuts into the metal —the force of the air in the torch parting the metal like melted cheese.

Then comes the patching. On large jobs, bolt holes must be cut all around the gap. Then a wooden frame, lined with canvas and padded to conform to the contours of the ship's side, is lowered and bolted into place.

This done, the ship is made air-tight. Water suction pumps on the barges above are set to work pumping out the water in the hold, at the same time sending down air to increase the buoyancy of the ship. And as the air enters, slowly, very slowly, the ship rises to the top to be hauled to the drydock for repairs.

This salvaging work is expensive. Sometimes it takes a year to raise a single ship, thus saving an investment of millions of dollars. But few projects have entertained me more than going down after a paltry 40,000 dollars which sank with the *Mt. Falcon*, a gambling ship anchored off the coast of Los Angeles.

The ship was sand ballasted and sat erect on the bottom. On the upper decks, the coin fell from the tables to the sand in the hold. In some places, the coin was piled three feet high, glinting slightly in the murky light cast by our electric safety lights. That was one time when I almost regretted the fact that they did not put pockets in diving suits!

We picked up what money we could see on the sand and then applied suction pumps to pull the sand on the deck, where they sluiced it, salvaging 98 percent of the total that went down with the ship. It's things like that which make life interesting.

Although I have had many interesting experiences as a deep sea diver, my first experience under water remains with me as something I will never forget. The first time a face-plate was snapped shut before my eyes to make my diving suit water-proof, I felt a lost, sinking sensation—as though absolutely cut-off from the rest of the world. People walked around me laughing, joking and slapping me on the back. And I stood sweltering in a 240-pound diving suit, alone, miserably waiting for the signal to go over the edge and down under the surface.

Finally it came. Clumsily, I maneuvered my 14-pound iron sandals onto the ladder. Cold water pressed the canvas suit close to my body. A weird, gurgling sound came to my ears as the air left the rear escapement valve and swiftly bubbled to the top. I stood alone in a new world of water, sand and seaweed — 10 feet below the surface. All was silent except for the rushing stream of air bubbles. Shadowy forms of startled fish darted off into obscurity. And I was afraid. I vowed that this would be my first and last trip under. That was 15 years ago.

Since then I learned the secrets of diving, and that the first law in diving, as in other work, is never to take chances. But even when exceptional precaution is taken, there are times in the career of every diver when the question of what to do means life or death.

A diver never knows what his next job will be. It may be a treasure hunt or it may be a simple repair job. In either case it may mean death. One very close friend of mine had his helmet knocked off when he was jammed under a pipe line by a cave-in. Another died of the bends while working on the Golden Gate Bridge in San Francisco. Who knows, I may be next? It may be on a hunt for Captain Kidd's lost gold. It may even be in bed!

Blind Man Invents "Polycord"

PLAYED with the fingers of both hands, a new musical instrument known as a Polycord, resembles two harps set side by side. The instrument has 61 strings on one side and 56 on the other, and is said to substitute the tone of four harps while its construction offers distinct advantages over both piano and harp. Evangelos Tsamourtzis, a blind Greek musician, invented the Polycord.

Clutchless Auto Passes Test

A CLUTCHLESS, gearless automobile, the dream of engineers for more than a quarter of a century, is said to have been successfully demonstrated in Cambridge, England. The test car, an ordinary type, was equipped with a new type of transmission which can also be adapted to the motors of buses, trains and ocean liners. The photograph shows the test car in operation.

De Luxe Trailer Requires Specially Built Tow Car

TOWED by a specially built auto with a wheelbase of 117 inches, which features eight forward speeds and a two-speed rear axle, the luxurious trailer shown above is owned by William Woods Plankinton, wealthy sportsman. The interior of the trailer, which resembles a private railroad car, provides sleeping quarters for two persons, a radio, heaters, closets and a kitchen with a refrigerator and running water facilities.

10,000 TREES in a

Tree dwarfing has been practiced in China for 2,600 years. The process is so closely guarded that James F. Craven experimented with more than 100,000 trees before he discovered the secret. How he dwarfs giant trees is told in this story.

by
Annie D. Nunn

This dwarfed orange tree bears miniature, full-grown, ripe fruit. Note how the cut fruit compares in size to the normal size orange.

IMAGINE a forest of 10,000 of the mightiest and most majestic trees in this country confined in a nursery 15 feet square!

That's the achievement of James F. Craven, of Glendale, Calif., magician-scientist, who dwarfs trees by a secret formula. He has miniature oaks, redwoods, maples, pines and the famous California sequoias that are 15 years old and less than 9 inches high, which, if allowed to grow normally, would be 100-foot giants.

Imagine grapefruit the size of golf balls and oranges the size of marbles; roses the size of a thumbnail and giant shrub plants that grow in flower pots! This is the story of the scientist who defies nature; of modern man who has wrested the secret process from the unfathomable Orientals who have been dwarfing trees for 2,600 years. Their closely-guarded secret has not only been discovered, but actually improved upon.

The practice of dwarfing trees was prevalent hundreds of years ago and today Japanese families, especially, possess at least

15-Foot NURSERY

one dwarf tree each. Some of these trees, handed down from one generation to another, live hundreds of years and are literally "family trees," since, artificially trained as they are by weights of various sizes, they record family records for every branch and every marking has a particular meaning. The Chinese taught the art of tree dwarfing to the Japanese, but they, in turn, kept the process a dark secret. But undaunted, scientist Craven experimented with 100,000 trees or more and finally succeeded in dwarfing one to his satisfaction. His method is an improvement over the Oriental method, in that his tree, *after having once been treated by his secret process, stay dwarfed,* while those produced by the Japanese must be treated from time to time to retard growth. Then, too, Mr. Craven dwarfs all kinds of bark forming plants. The Japanese have been successful with only the cone bearing trees.

"A tree must show its age to be interesting," Mr. Craven told me recently, "and there is no way of faking age, since trees take on markings only with the passing of time. He held up a venerable fir tree 7 inches tall. There was no mistaking its age. It had knarled, twisted limbs, a thick trunk and heavy bark. It was also loaded with fully developed cones no larger than the head of a pin!

We walked about the grounds of Mr. Craven's home, where numerous astonishing specimens of years of valuable research are tucked away. Mr. Craven pointed to a tiny rose bush that grew in a shallow bowl in a secluded spot. "It is the same with shrubs and vines," he said. "Notice, for instance, the ruggedness of this bush which is 9 years old and but one and a fourth inches high.

"Why, it's covered with roses!" I exclaimed. "Roses no larger than my little finger nail!"

Mr. Craven extracted a magnifying glass from his pocket. "Take this. It will give

Note how the rose on this full-grown dwarfed rose bush compares in size to a thimble and normal rose.

The dwarfed giants above are: (1) Sequoia, 7 years old, 3 in. tall; (2) Pinus Montana, 8 years old, 3 in. tall; (3) Pine, 10 years old, 3½ in. tall; (4) Cembroidas Pine, 15 years old, 8 in. tall; (5) Cryptomeria, 6 years old, 6 in. tall.

Left: James Craven is shown inspecting a rose bush several inches high. This "giant" plant blooms from January until late fall.

you a better view. This bush blooms from January until late fall."

I took the glass and held it above the incredible little bush. Its roses were fully grown and perfect in every detail. Then he showed me a 7-year-old naval orange tree, 18 inches high. Its oranges, which were the size of a medium marble, were well developed and as well flavored as the average orange. He has had citrus trees to bear at the age of six months. A diminutive grape vine had sweet juicy fruit in clusters a little over an inch long.

By treating the seed before it is planted, Mr. Craven can predetermine the height of a tree. He can also produce in miniature, replicas of trees of normal size, giving them the identical form, shape and number of branches. He does it by treating the cambrium layer, that life giving, bud-filled organ that lies between the bark and the wood of the tree. This is done when the tree, previously dwarfed, is from one to two years old.

"There is nothing magical about all this," said Mr. Craven. "It is done scientifically, by following the laws of nature. For instance, after trees are dwarfed they must be allowed to grow naturally, because the crown and the

The dwarfed, fruit-bearing orange tree is shown beside its full-grown counterpart, at scientist Craven's nursery.

roots should have definite balance with relation to each other."

Paradoxically, Mr. Craven can produce a dwarf tree which is actually 20 years old, within one year! He does it by treating the cambrium layer of a branch on a normal tree, known to be 20 years old, which has been selected to be the new dwarf tree. This develops the root buds in the cambrium layer of the branch. If properly protected from air, and kept moist, in 6 months the root buds will grow into a perfect root-system on the outside of the bark of the branch while it is still growing on the tree. Then he cuts the branch from the mother tree, with the roots it now possesses, dwarfs the new tree and plants it. The tip of the branch may be cut off, if desired, to get the heavy bark on the trunk of the dwarf. For convenience many of the dwarfed trees are kept in flower pots. I inquired whether this had anything to do with the size of the trees.

"Nothing whatever," he replied, "as trees from seeds which I have treated cannot obtain normal size no matter where they are placed."

Thus it is not unusual to find Mr. Craven's trees growing in bowls, pans, basins and as well as in flower pots and even in the open soil.

Most of the experimental work on tree culture is done in his nursery which is about 15 feet square and contains some 10,000 tree seedlings at present. It is the smallest nursery in the world! And behind its closely guarded door he often sacrifices 20,000 seedlings in one experiment. By such extensive experimenting, positive results always are obtained.

"As novelties, dwarf trees are interesting," said Mr. Craven, "but the object of my experimentation has a more practical angle, one that may in time be of immense value to the public. Having discovered the secret of dwarfing trees, I am now working on the reverse idea—the rapid development of the root system of normal trees to speed up their growth."

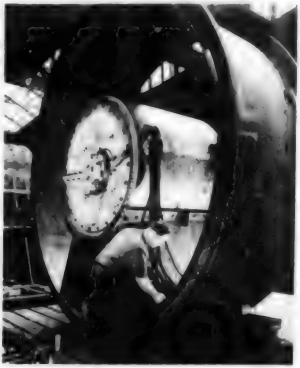
After experimenting with 15,000 seedlings, seedlings were produced which had roots 48 inches long in a year's time. This root growth would normally require 4 to 6 years in open soil. Twenty-five to fifty thousand of these plants may be grown in a nursery 15 feet square. After being transplanted at the end of the first year, they will reach maturity in about half the time that normal trees do, claims Mr. Craven.

The history of the world is replete with strange stories of scientists whose dreams it was to speed up or slow down growth of human beings. But like the story of the alchemists who strived to learn the secret of making diamonds in the laboratory, their efforts proved futile. But now that the skill of science has begun to produce modern wonders in the natural world; to enclose the secrets of the soil in a bottle of chemicals, fantastic dreams of men once thought mad may yet come true.

"Claws" Aid Berry Pickers

BERRY pickers near Heron, Montana, have developed canvas "catchers" and "claws" which simplify their job and enable a fast worker to fill 50 one-gallon tins daily. The catcher is held under the bush with one hand while the other hand wields the claw to beat the bush free of berries.

Motor Built For Wind Tunnel



DEVELOPED for use in a new wind tunnel to be installed at Massachusetts Institute of Technology, the 2,000-horsepower four-speed electric motor shown above will whirl a huge propeller to create winds of a 400 M.P.H. velocity. The tunnel will be used to conduct tests on model airplanes.

Lightweight Self-Contained Helmet-Suit Has Many Uses

A NEW all-purpose helmet-suit with a self-contained breathing unit can be used for aerial work in rarified atmospheres, deep sea descents and fighting fires, smoke and gases. Developed by Jack Browne, of Milwaukee, Wis., the suit is made of rubberized fabric and weighs only 100 pounds, including a spun-brass helmet, lead chest weight, lead-soled shoes and steel cylinders containing oxygen and air

Rollers Curve Steel Sheets

OPERATING in the manner of the familiar home washing machine, a huge roller press installed in the plant of a well known electrical products manufacturer rolls sheets of heavy steel into a cylindrical shape. The sheet shown above will become a tank body for a large oil circuit breaker.

Table Lamp Holds Magazine

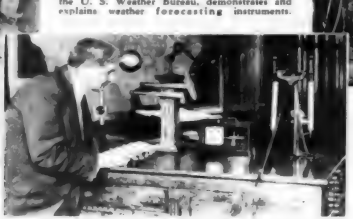
DESIGNED to hold a magazine at a convenient angle and to flood the printed page with a soft diffused illumination, a new read-while-you-eat lamp has recently been placed on the market. The light emanating from a 75-watt bulb is diffused by an opal glass bowl inside the lamp's reflector shade.

Waterproof Roofing Formed As Interlocking Slabs

NO HEAVIER than an ordinary asphalt shingle roof and claimed to possess excellent insulating properties, a new type of roof consists of interlocking slabs made of a mixture of water-proof cement, crushed slag and treated sawdust. Developed by Raymond Meredith and Lief W. Andersen, of Annapolis, Md., the roofing sections are formed in an open pan mold and are applied directly upon the rafters of the roof without the use of sheathing. The sections are three feet long, two feet wide and five-eighths of an inch thick and are made waterproof through an application of an asbestos cement.

Second MI Movie

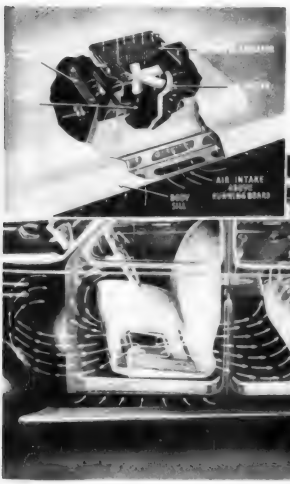
Here are some scenes from the four interesting sequences that make up the second MECHANIX ILLUSTRATED-Vitaphone movie. Don't fail to see the full reel at your favorite theatre. Top: Behind the scenes for the first time in the television studio of the National Broadcasting Company, Radio City: the mysteries of "seeing by radio" made clear at last. Left, above: Do you know what happens when you ring a fire alarm? The famed New York Fire Department staged a spectacular rescue to show how fire fighters work. You'll be thrilled by this exciting sequence. Left: Ira Genet, Warner Bros. director (in shirt sleeves), watches the firemen in action "on location." Right: Vitamins play an important part in health conservation. The MI movie takes you into the laboratories of the U. S. Vitamin Corp., New York, and shows how they are analyzed and prepared. Below: Dr. James H. Kimball, of the U. S. Weather Bureau, demonstrates and explains weather forecasting instruments.



Remote Control Gear Shifting in 1939 CARS

RICH appointments and many mechanical improvements make the 1939 automobiles more beautiful in appearance and more economical and comfortable in operation than ever before. The outstanding mechanical trend is adoption of remote control gear shifts by practically all manufacturers, a few of whose latest models are described briefly on this and following pages.

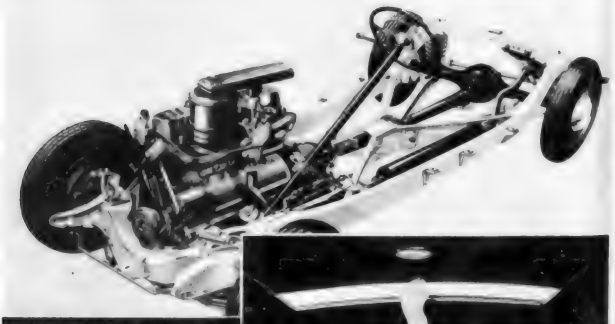
The gear shift lever of the 1939 De Luxe Plymouth is mounted on the steering post (left, above) and the hand brake is at the driver's left, providing unobstructed floor space. The instrument panel has no protruding knobs to menace passengers in case of sudden stops. Above—The clean-cut, non-angular front end of the beautiful new De Luxe Plymouth.



Dodge and Chrysler automobiles for 1939 feature a high capacity heating, air filtering and ventilating unit which, positioned beneath the front floor pan (left, above), draws outside air from above the running board. The air is drawn through a passage formed in the body and is then filtered to remove dust before passing through the core of an efficient heater to emerge from a special vent located under the front seat, as shown in left diagram.

Important mechanical improvements, modern streamlining and rich appointments are offered in the new Pontiac models. At left is the Deluxe with rear springing, hypoid rear axle and inclined shock absorbers which provide a cushion-power ride. Below —Chromium grilles flank the Pontiac's radiator with its famous Silver Streak motif which runs over center of the hood.

Harmonizing multi-beam headlights are mounted on the front fenders of the new Pontiac (right). The radiator ornament serves as the locking handle to raise the alligator type hood for inspecting engine.



The new Buick appears lower and longer, an effect achieved by improvements in chassis design (above) which materially lowers the car while maintaining a flat floor without a tunnel. Many of Buick's new models feature a "Sunshine Turret Top," which can be opened as shown at right. The movable panel does not effect the top's highly rated structural strength.

For 1939, the American Bantam Car Company enters the four-passenger field. Pictured at the right is the company's sporty "Speedster 60" model.

Below—Ultra-modern lines which create a rakish appearance are shown in the 1939 Hupmobile models. Gear shift is an steering column.

A "Turret Top Sunshine Roof" is an optional feature on the 1939 Cadillac (left) and La Salle sedans. The easily manipulated sliding panel provides the fresh air and sunshine advantages of convertible models in closed car bodies.

More beautiful than ever, the 1939 Packard models boast improvements designed to provide added comfort, driving ease and longer life. Shown at right is the new Packard fifth shock absorber system which suppresses sidewise or transverse road shocks.

MI Readers'

IF YOU fail to read the advertising section of MECHANIX ILLUSTRATED you are cheating yourself of learning about many valuable opportunities, for advertisers spend thousands of dollars yearly on producing interesting booklets on a variety of subjects which can help you to secure training for a better paid job, make your home more comfortable and attractive, simplify the problem of automobile maintenance, improve your health, increase the sense of your home workshop activities, etc.

To bring these opportunities to your attention and to simplify your obtaining information from the advertisements that interest you all the offers made in this issue, with the exception of those in the classified section, are listed on this and the opposite page. Study the list carefully.

It is the function of the Readers' Service Bureau to act as a clearing house for both readers and advertisers. The listing gives offers made, the cost of each, and a convenient identifying number. To simplify the ordering of booklets, samples, catalogs, etc., the bureau will forward your requests to three, or less, of the firms listed.

To take advantage of this service, merely write your name and address on the coupon, mark the numbers of the offers wanted, and mail the coupon to Readers' Service Bureau, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y. We will do the rest.

If the offer selected is listed as "free," all you have to do is to send in the correctly marked coupon. If there is a small charge (usually only 5c and rarely more than 10c, to cover cost of mailing bulky catalogs, etc.), be sure to include the correct amount with the coupon. U. S. postage stamps are acceptable

NOTICE

Don't fail to examine all advertisements in this issue and the offer they make. We are willing to forward three of your requests for booklets, etc., but don't let this stop you from ordering additional material directly from other advertisers. REMEMBER — read the advertisements carefully.

Offer No.	Firm	Type of Business	Offer Made	Charge	Page
1	A and N Supply Co.	Outdoor Goods	Catalog	10 Cents	26
2	Ace Tool Co	Tools	Catalog, Instructions, Tool	10 Cents	32
3	Advertising Institute of America	Instruction	Book	Free	14
4	Allied Radio	Radio Supplies	Catalog	Free	143
5	American Landscape School	Instruction	Details, Book	Free	122
6	American School	Instruction	Bulletin & Lesson	Free	17
7	American School	Instruction, Air Conditng.	Details	Free	24
8	American School	Instruction, High School	Details	Free	29
9	American School	Instruction, Mech. Engrg.	Details	Free	26
10	American School	Instruction, Diesel Eng.	Bulletin	Free	32
11	American School	Instruction, Drafting	Bulletin	Free	20
12	American School of Photography	Instruction	Booklet	Free	28
13	Charles Atlas	Health Instruction	Book	Free	16
14	Atlas Press	Tools	Catalog	Free	135
15	Bass Camera Co.	Cameras, Supplies	Price List	Free	32
16	Bausch & Lomb	Microscopes	Book	Free	124
17	L. L. Bean	Hunting, Camping Specits.	Catalog	Free	133
18	Benjamin Air Rifle Co.	Air Rifles	Targets	Free	22
19	Boice-Crane Co.	Power Tools	Catalog	Free	130
20	The Book Supply Co.	Books	Catalog	Free	32
21	Brooks Appliance Co.	Health Appliances	Details	Free	26
22	Brownscope Co.	Telescopes	Catalog	Free	128
23	Bild-Ur-Own Devices	Scooter Kits, Motors	Book, Plans	10 Cents	20
24	Casein Co. of America	Glue	Handpook	Free	21
25	Central Camera Co.	Photo Supplies	Catalog	Free	120
26	Chartered Institute of America Invtrs.	Selling Inventions	Details	Free	28
27	Chicago Technical College	Instructions, Air Conditng.	Lesson	Free	28
28	Chicago Technical College	Instruction, Drafting	Lesson	Free	23
29	Chicago Wheel & Mfg. Co.	Tools	Catalog	Free	145
30	Cleveland Model & Supply Co.	Models	Catalog	10 Cents	20
31	College of Swedish Massage	Instruction	Booklet	Free	142
32	Columbian Correspondence College	Instruction, Civil Service	Catalog	Free	14
33	Coyne Electrical School	Instruction, Radio	Book	Free	30
34	Coyne Electrical School	Instructions, Electrical	Book	Free	18
35	The Craftsman	Woodworking Equipment	Catalog	10 Cents	144
36	Crosman Arms Co.	Rifles	Book	Free	126
37	Henry Disston	Tools	Manual	Free	127
38	Dodge's Institute	Instruction	Catalog	Free	20
39	Dremel Mfg. Co.	Tools	Booklet	Free	120
40	Electrical Salvage	Radio Supplies	Catalog	Free	24
41	Electro Torch	Welding Equipment	Details	Free	23
42	Engineer Dobe	Instruction, Drafting	Book	Free	32
43	Victor J. Evans & Co.	Patent Attorney	Books	Free	13
44	Franklin Institute	Instruction	Booklets	Free	33
45	Foley Mfg. Co	Saw Filing	Plans	Free	143
46	GHQ Motors	Model Engines	Catalog	3 Cents	122
47	A. C. Gilbert Co.	Chemistry Sets	Book	Free	119
48	Gilbert Hall of Science	Toys	Catalog	Free	15
49	Gunmetal Co.	Plating	Details	Free	142
50	Harley-Davidson Motor Co.	Motorcycles	Magazine	Free	121
51	Hemphill Diesel Schools	Instruction	Details	Free	30
52	Hobart Bros.	Welding Equipment	Book	Free 26,	119
53	Ideal Aeroplane & Supply Co.	Model Boats and Planes	Catalog	10 Cents	24

Service Bureau

No. Offer	Firm	Type of Business	Offer Made	Charge	Page
54	Institute of Applied Science	Instruction	Details	Free	30
55	International Correspondence Schools	Instruction	Details	Free	25
56	International Correspondence Schools	Instruction	Booklet	Free	3
57	J & H Metal Products Co.	Tools	Catalog	Free	6
58	Kant-Slam Co.	Hardware	Details	Free	120
59	Kelsey Presses	Printing Presses	Catalog	Free	132
60	LaSalle Extension Univ.	Instruction, Accounting	Book	Free	9
61	LaSalle Extension Univ.	Instruction, Law	Books	Free	20
62	Lejay Mfg. Co.	Electrical Machinery	Plans, Catalog	10 Cents	23
63	Lincoln Airplane and Flying School	Instruction	Details	Free	16
64	Lincoln Engineering School	Instruction, Radio, Elec.	Catalog, Magazine	Free	24
65	The Lionel Corp.	Model Trains	Catalog	10 Cts. 123,	126
66	McSweeney Trade School	Instruction	Book	Free	8
67	Mechanix Universal Aviation Service	Instruction	Details	3 Cent Stamp	32
68	Michigan Trade School	Instruction	Folder	Free	26
69	Midwest Radio Corp.	Radio Equipment	Catalog	Free	22
70	Carl Miller	Patent Attorney	Book and Form	Free	6
71	Albert Mills	General Merchandise	Details	Free	23
72	National Poultry Institute	Instruction	Book	Free	24
73	National Radio Institute	Instruction, Radio	Book	Free	5
74	National Schools	Instruction, Diesel Eng.	Book	Free	18
75	National Schools	Instruction, Radio	Book	Free	26
76	New York Institute of Photography	Instruction	Booklet	Free	142
77	N. W. School of Taxidermy	Instruction	Book	Free	126
78	Northwestern School of Taxidermy	Instruction	Book	Free	142
79	Clarence A. O'Brien & Heyman Berman	Patent Attorneys	Booklet	Free	7
80	Pan America	Musical Instruments	Book	Free	130
81	Plastex Industries	Novelty Mfg. Tools	Book	Free	24
82	Porter Chemical Co.	Chemistry Outfits	Book	Free	19
83	L. F. Randolph	Patent Attorney	Booklet	Free	6
84	Raye Burns School	Instruction, Cartooning	Details	Free	142
85	Reclaimo Mfg. Co	Oil Filters	Booklet	Free	124
86	Re-Nu Tire Groover	Tires	Details	Free	128
87	Rollins Instrument	Drawing Board	Circular	Free	16
88	Harry Ross	Magnets, Microscopes	Catalog	10 Cents	24
89	Shamrock Trailer Parts	Trailer Parts	Catalog	Free	142
90	Silver Mfg Co.	Radio	Catalog	Free	28
91	L. C. Smith & Corona Typewriters	Typewriters	Booklet	Free	131
92	Smooth-On Mfg. Co.	Cement	Book	Free	125
93	C. A. Snow & Co.	Patent Attorneys	Books	Free	27
94	So-Lo Works	Rubber Molds	Book, Buyers List	Free	143
95	South Bend Lathe Works	Tools	Catalog, Booklet	Free	34
96	Speed Way Mfg. Co.	Tools	Circular	Free	132
97	Stamford Co.	Opportunity	Booklet	Free	20
98	Standard Business Training Institute	Instruction	Details	Free	24
99	Tasope's School of Modern Photography	Instruction	Book	Free	130
100	United Factories	Oil Burners	Details	Free	30
101	United Mushroom Co.	Mushroom Growing	Details	Free	26
102	United States Dental Co.	False Teeth	Catalog, Mouth Forms	Free	30
103	Universal Photographers	Instruction	Catalog	Free	30
104	Walker Turner Co., Inc.	Tools	Catalog	Free	119
105	Westwood Correspondence School	Instructions, Airplane Des.	Booklet	Free	24
106	Wholesale Radio Service Co., Inc.	Radio Supplies, Gifts	Catalog	Free	31
107	Wholesale Radio Service Co., Inc.	Radio, Camera Supplies	Catalog	Free	128
108	Wisconsin School of Watch Repairing	Instruction	Details	Free	142

Readers' Service Bureau
MECHANIX ILLUSTRATED,
1501 Broadway, New York, N. Y.

I am interested in the following offers:
(Put numbers in squares)

I am enclosing ____ cents in stamps
(Ignore this line if all offers are free.)

Name

Address

City and State

Note: This offer expires January 1, 1939. After this date, write directly to advertisers for offers.

Submarines

I AM confident that one of these days I will be able to walk along the cargo docks and see freight packages plainly labeled: "Ship by submarine."

For freight—and passenger-carrying submarine routes are certain to be established sometime. That certainty of the future is casting its shadow on us just as the coming of the airplane and the electric light and radio communication and all the other great advances of our age were signaled in advance. The Wright brothers and Thomas Edison and Guglielmo Marconi did not realize, perhaps, how great was the world's need for these commonplaces of today. Henry Ford did not think he was making over the United States when he tinkered with a gasoline engine in a rickety shop. But they kept puttering around and were laughed at and suddenly their nonsensical ideas became a part of modern life.

Freight and passenger-carrying submarines will come into use because they are a step ahead of the surface ships of today, just as the first wheezy, stuttering steam-engines furnished a better source of power than blind-folded horses walking around a dusty ring.

Trade routes will be established between European and Oriental and Russian ports, and some of our Northern Pacific ports. The distances now covered by some lines using the Suez and Panama canals will be almost cut in two.

I have previously shown that a submarine is at an advantage as compared with a surface ship because it is relieved of so much dead-weight. In time of storm it need only submerge to a zone of quiet. In good weather it will ride the waves just as the *DEUTSCHLAND* did when Captain Koenig brought her over. Even in the midst of war he only found it necessary to do eighty miles submerged.

Not the least of its advantages is that a submarine can enter ice-bound ports. Vladivostok need never again be closed by the Russian winter. Travel under the ice is more comfortable and safer than bucking winter seas. That has been shown. This is not intended as a bit of sensationalism. It is a simple statement of fact. It is probably true that the reader will recoil at the mere thought of a voyage in the depths of the sea, a lid of ice

[*Continued on page* 123]

in the Future

MI'S "BOOK OF THE MONTH"

The material on these pages is reprinted by special permission of the publishers of "SUBMARINE", The Autobiography of Simon Lake, as told to Herbert Corey.

Every month several meritorious books of special interest to readers of MECHANIX ILLUSTRATED are published. The purpose of this department is to bring outstanding books in the fields of invention, science, mechanics and adventure to the attention of our readers.

Those who wish to read these books in their entirety may order them from local book stores or by mail from the publishers.

"SUBMARINE" is published by the D. Appleton-Century Co., 35 W. 32nd St., New York City. The price is $3.

by SIMON LAKE

(Submarine Inventor)

As told to HERBERT COREY

Because of the inventions of Simon Lake (below) the modern submarine runs on an even keel, is controllable under water, it sees instead of being blind, and it may be operated with a good measure of safety and comfort to the crew. Lake obtained more than 100 patents on submarines. The "Defender" was one of the early submarines with special equipment on the superstructure for observing marine life and conditions while traveling under ice.

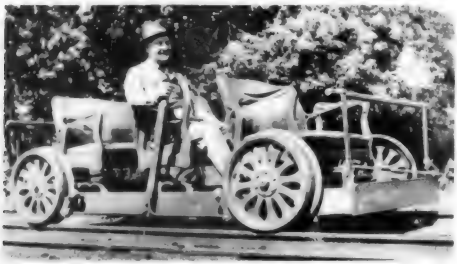
Invents New Radio Compass

INVENTED and developed by Warren S. Eaton, well known aeronautical engineer, a new radio compass is said to be unaffected by static which renders other radio directional instruments inoperative. When the new device is tuned to the proper station, the compass needle automatically indicates the direction of the received radio wave, thus guiding the pilot to the airport from which the waves are emanating, facilitating "blind" landings on foggy days.

Tiny Television Set Devised

SHAPED somewhat like an ordinary hand telephone, a miniature television receiver which was recently placed on exhibition in London, England, weighs only two pounds. To operate the receiver, it is held so that sound is heard through an earpiece while a television screen is viewed through an opening in the curved end of the instrument, as shown in the photo above. A small dial enables the user to tune the receiver for better reception of broadcasts.

Buys Unique Railroad And Car Equipment For $301

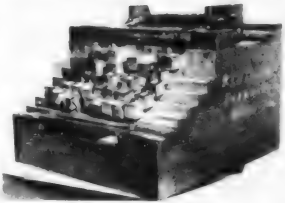


WHAT is probably one of the most unique railroads in the country is now owned by Roy Rawlings, of Hope Valley, R. I. Purchased for $301, the Wood River Branch Railroad, as the railroad is known, consists of a gasoline engine, a caboose, about 5½ miles of trackage and the "Presidential Special" (left).

Collector Buys 200,000 Patent Models

Mr. Gaige is shown holding a fire-proof safe patented by H. Urban on Oct. 30, 1877. Also shown in the photograph are printing presses, addressing machines, a page numbering machine, a meat cutter, combination locks, handcuffs, hand stamps and a device for a rope fire escape. At the right is shown a typewriter patented by Robert T. P. Allen of Farmingdale, Ky., in 1876.

CROSBY GAIGE, theatrical producer, who pursues the hobby of collecting art, antiques, fine books, vintage wines, has added another phase to an already broad one with the purchase of 200,000 patent models submitted to the United States Patent Office from 1820 to 1890. Mr. Gaige describes the collection as "the actual history of American material development for more than half a century."

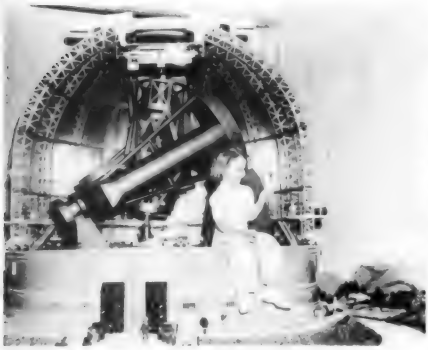


The collection includes among its almost countless number of models, typewriters, steam engines and boats, office appliances, cannons, machine guns, cash registers, a hog catcher, printing presses, a dentist's chair, a portable burglar alarm, devices to raise sunken vessels, the original egg beater, pianos, a meat cutter, safety crutch, hand cuffs, hand stamps, addressing machine, combination locks, page numbering machines, and a pretzel bending machine.

Besides the models, the collection includes patent applications with drawings of the devices by their inventors. Among these is an application covering the design of a system of air chambers intended to aid vessels in the navigation of shallow waters. Dated 1864, the inventor according to the application, was Abraham Lincoln.

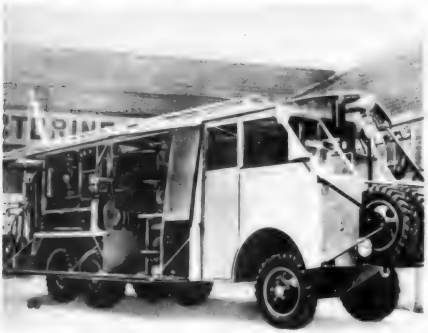
Steel Barrier Keeps Traffic Separated

A STEEL barrier, eighteen inches high and tapering from a tube at the top to a base twenty-six inches wide, is being tested by the Michigan Highway Commission as a device to keep opposite lanes of traffic separated. Even the most reckless drivers will find it difficult to cross over the center of the road when this barrier is set up. Its eighteen-inch height makes it almost impossible to cross.



Model Duplicates Palomar Observatory

JANET CHAPMAN, Warner Brothers starlet, gets right down to the study of astronomy as she visits this replica of the Mt. Palomar Observatory, an exact duplicate of the gigantic observatory on Mt. Palomar. The replica reproduces every movement and function of the original. It is operated by twenty delicately tuned motors, the smallest of which produces one-eightieth of a horse-power. It will soon go on a world tour to display the superb craftsmanship of the model.

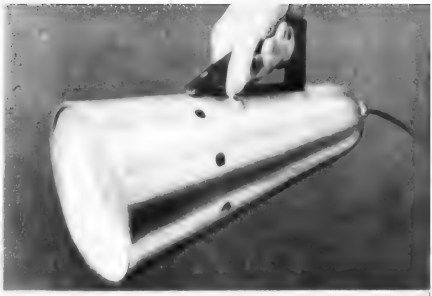


Workshop Designed For Front Line Use

DESIGNED to service pursuit and combat planes based near front lines in time of war, this mobile workshop is equipped to make both major and minor repairs. It will also furnish light and radio for an emergency field. It was designed by Kibbey W. Couse, a mechanical engineer, and is an offspring of a welding cruiser developed by Mr. Crouse to make spot repairs on road-construction machinery.

New Insect Killer Uses Infra-Red Ray

THIS new insect killer which employs the penetrating sections of an infra-red ray, spells death to fleas as well as other insect pests. Harmless to animals and humans, its action on crawling pests is quick and effective. Of spun steel, it is held easily in the hand by means of its non-heat-conducting handle. It operates on either a.c. or d.c. current with equal effect.



Device Determines Line Plunge Force

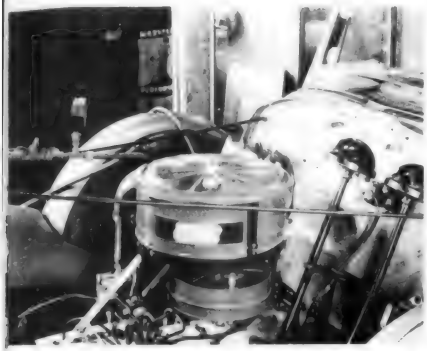
WITH the aid of this measuring device, it has been found that when a 210-pound lineman charges, the force exerted amounts to 1.5 to 1.7 horsepower. By attaching a padded harness which encircles the neck and shoulders of the player, to the spring, and having him pull instead of push, his pulling power also can be ascertained. The equipment was developed and built by Professor E. C. Clevett of the Purdue University physical training department. This device shows clearly the plunging power of different players.

Oil Can Carries Its Own Illumination

THIS oil can fitted with a small electric light makes it possible for the filling station attendant to have plenty of illumination while checking and filling the car engine with oil. Ordinarily when oil is added at night, it is difficult to see the filling pipe unless a flashlight is available. With this device, the light is always there when oil is being added.

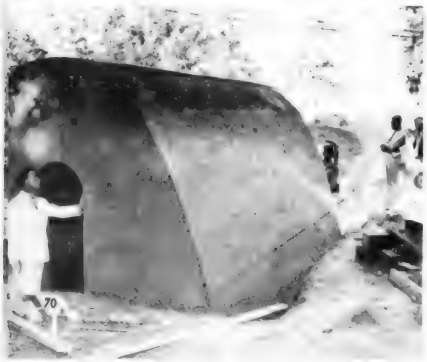
Floating Bridge Is Nearly A Mile Long

THE longest floating bridge in North America, fifteen feet wide and with its driving surface just a few inches above the water, stretches across Chemong Lake near Peterboro, Ont., Canada. Nearly a mile long, the bridge is anchored every hundred feet with chains and large boulders. A stout railing lines each edge from shore to shore. Bays are built out from the edge to enable cars to pass in safety.



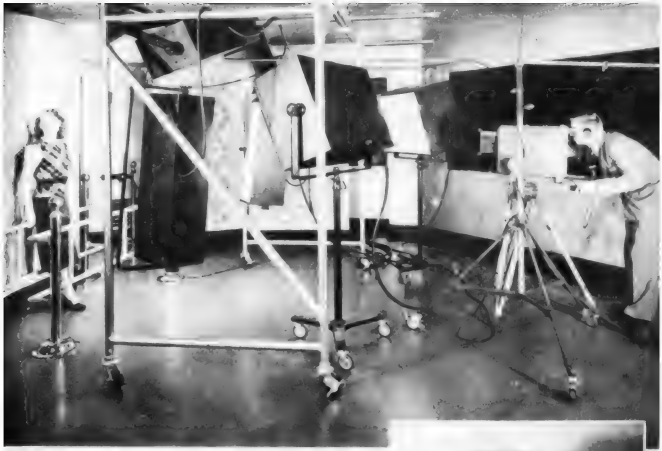
Air Cleaner Removes Dirt From Intake

THIS new air cleaner for cars removes grit and dust from the air drawn into the carburetor intake, and expels it immediately. The air is caught at the intake and deflected. Deleterious material is drawn from it and then carried by a special air cleaning liquid, into a "dirt receiver." The air then passes through a condenser and expansion chamber, and enters the engine. It is claimed that this device can save millions of dollars a year in premature wear on any type of air-breathing engine.



New Pill-Box Fort Erected In 4 Hours

THIS is one of the new pill-box forts which was made in four hours. Using the vacuum concrete process, the concrete was hardened in as many hours as it takes days by the ordinary process. The fort was erected as a demonstration to U. S. Army officers that bomb-proof shelters and defense fortifications can be constructed over night in the event of attack by a foreign power.



Betty Goodwin, NBC's first television announcer, is shown before the camera in the new demonstration studio, being televised by Robert W. Clark, television engineer, standing between the televising camera.

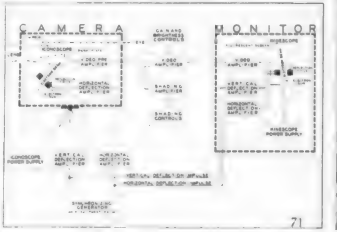
TELEVISION TOUR For Radio City Visitors

Above—The equipment in this receiver-monitor is enclosed in glass for the benefit of visitors on the television tour. Below—A simplified diagram of the television demonstration equipment.

THE newest radio innovation in America—regularly conducted tours for the public of "behind-the-scenes" in television—is demonstrated by the National Broadcasting Company at Radio City.

The tours give visitors an opportunity not only to view real telecasts, but to participate in television demonstrations themselves during their visit to the studio. Each group appears before the camera for the party following, which sees the first group on receivers in an adjoining room.

The exhibit includes a complete television studio. This is a self-contained unit, entirely separate from the one now in use for the current experimental telecasts by NBC-RCA over Station W2XBS atop the Empire State Towers. An explanation of the fundamentals of television also is provided.



Devil-Face Auto Lamp Warns Of Speeding

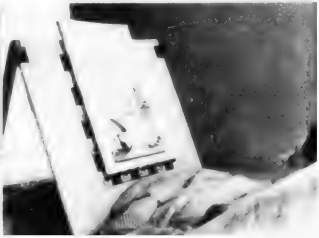
HOOKED above the windshield of an auto, a novel devil-face lamp (inset) illuminates when the car exceeds a safe speed, warning the driver. The device is actuated by the air blast of the engine fan, which causes an electrical contact to be made.

"Mosquito" Plane Has Tiny 30 H.P. Motor

DEVELOPED to encourage greater interest in sport flying, a new French lightplane is powered by a tiny motor of only 30 horsepower. Aptly named the "Mosquito," the aircraft weighs only 720 pounds fully loaded with fuel and pilot, travels at a speed of 78 m.p.h. and has a cruising range of 200 miles. The wingspan is 26¾ feet, length 19 feet and height, from ground to top of wing struts, only 6½ feet.

Gameboard Cheers Invalids

DESIGNED for use by patients confined to bed, a new gameboard is fitted with metal pockets for holding cards (left), making it possible for the patient to play solitaire while fully reclined. The reverse side of the board features a peg-type checker board (lower left), the pegs of which can be plugged into the bottom row to support a magazine, as shown below.

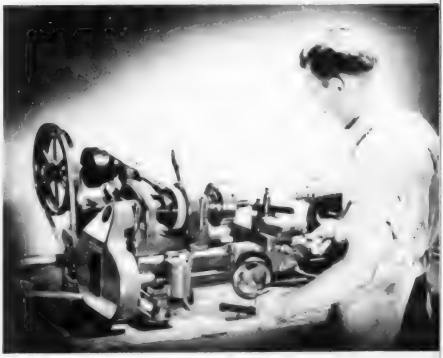


Drive-In Theater Has Room For 500 Cars

CONSTRUCTED on the site of a former airport at Valley Stream, N. Y., a new open air drive-in motion picture theater accommodates 500 automobiles at a single performance. The semi-circular ramps on which the cars gather before the screen are arranged so that the front of each car is elevated and the rear depressed.

Metal-Working Lathe Boasts New Features

EQUIPPED with a one-third horsepower motor and adjustable horizontal countershaft, with two-step pulleys to provide speeds ranging from 40 to 1,200 r.p.m., a newly developed back-geared metal-working lathe is specially designed to handle the machining of very small diameter parts of steel, cast iron, brass, etc. The lathe is equipped with many new features providing greatest accuracy and precision and takes 38 attachments for a variety of jobs including grinding, milling, etc.



Starts 7,000-Mile Trip In 1907 Automobile

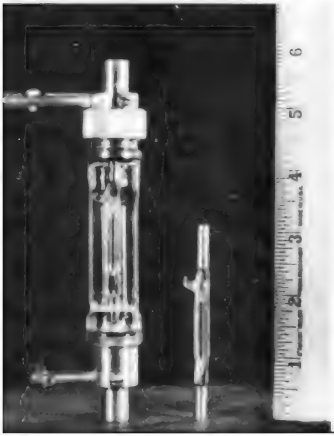
TRAVELING in a two-seater automobile which he bought second-hand in 1907, George C. Green, and his wife, of Lambertville, N. J., have started a vacation tour of the United States during which they hope to cover more than 7,000 miles. The venerable car has a top speed of 30 m.p.h. and the wheels are fitted with motorcycle tires.

Welded-On Alloy Strips Improve Iceboat's Runners

APPLIED to the runner edges of an iceboat by welding (above), a strip of wear-resistant alloy of cobalt, chromium and tungsten is said to make the edges keener and long-lasting. After cooling from the welding operation, the alloy-tipped runners are ground sharp in the same manner as plain steel runners and are then ready for use (above), sliding easily over the ice due to a low coefficient of friction.

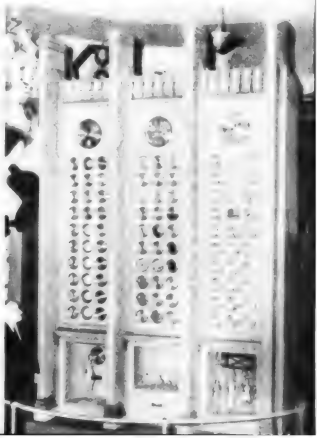
New Lamp Is "Midget Sun"

DEVELOPED specially for use in photo-engraving work, searchlights and for therapeutic application, a new 1,000-watt mercury lamp is only slightly larger than a cigarette. An ingenious water-cooling jacket into which the lamp is inserted permits three quarts of water per minute to flow past the lamp, dissipating the tremendous heat generated when lit. The photo shows the lamp and its water-cooling jacket.



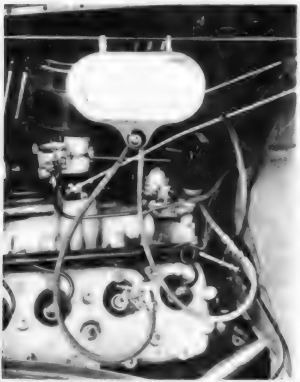
Novel Clock Boasts 93 Dials

CONSTRUCTED at the suggestion of the late King Albert of Belgium by his clockmaker, Lodewyk Zimmer, a clock with 93 dials was recently placed on exhibition in New York, N. Y. The clock shows the relation of the planets to the earth and sun at any time and the earth's position in its orbit around the sun. The clock also provides sidereal time, meridian time and an imaginary time based on a day of only ten hours.



Builds Home And Furniture From Old Newspapers

BECAUSE he disliked throwing away old newspapers, Elis Stenman, of Pigeon Cove, Mass., developed a process whereby he could fold them tightly and fashion them into panels from which he constructed a home and a complete suite of furniture, as shown in the photographs above. More than 100,000 newspapers were used to complete the project and the walls are composed of panels, each of which is 215 sheets thick.



Gauge Shows Engine Faults

PROVIDING a simultaneous triple check of an automobile motor, a new garage device features three gauges which register oil pressure, individual cylinder compression and the vacuum and pressure on the fuel pump intake and output sides, respectively. The device can also be used to check valve troubles, spark advance and other ignition deficiencies.

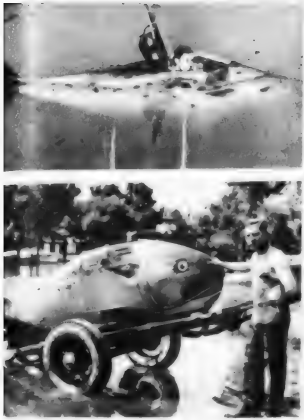
Instrument Tests Motor Oil

FEATURING a calibrated dial indicating "good," "bad," or "?" a new instrument employs an electric eye to determine quickly the condition of crankcase oil. A sample of the oil is placed on a glass slide which is then inserted in the instrument. The amount of light that passes through the oil to reach the electric eye determines the dial's reading.

The DC-4's radio receiving and transmitting equipment is mounted in panel form behind the pilot, as shown above and at upper right, but are remotely controlled in flight by a master control column resting between the pilot and co-pilot. Below—A direction-finding loop is mounted in plane's nose.

DC-4 Airliner Has Powerful Radio

THE recently developed 42-passenger Douglas DC-4 airliner is equipped with the most powerful and comprehensive radio equipment yet produced for commercial air transport service, making it possible, for the first time, for a flight crew to make simultaneous observations of beacon, weather and marker signals while holding two-way communication with the landing field. During flight, the pilot may talk over any one of ten different frequency bands and a special direction-finding loop enables him to instantly check the plane's position with respect to ground stations. The radio panel is installed behind the co-pilot's seat.



Makes 14-Mile Underwater Trip In Home-Built "Sub"

A NOVEL one-man fish-shaped submarine, in which he has made 347 dives, has been constructed by Barney Connett, of Chicago, Ill. The underwater craft is powered by two sets of batteries and has the usual submarine equipment including blowers, oxygen supply, air pumps and a respirator. Traveling three feet under the surface of Lake Michigan, navigating by means of a four-foot periscope, Connett recently made a 14-mile trip in his submarine.

Truck Enables One Man To Move Piano Up, Down Stairs

ENABLING one man to move a piano up or down a stairway, a hand truck developed by Herbert Mueller, of Hollywood, Calif., balances first on its front wheels and then on the back wheels, which are so constructed that they automatically proceed to the step above (or below, if descending) when the piano's weight is supported by the front wheels. As shown in photo, the piano remains level throughout the ascent or descent of the stairway.

Cotton Picker Device Mounted On Tractor

MOUNTED on a specially designed tractor, a new cotton picker developed by John and Mack Rust, of Memphis, Tenn., picks each row of planted cotton twice in a single operation. A smaller cotton picker, which can be hitched to general utility tractors, was built by the brothers last year.

A list of manufacturers of items mentioned in MECHANIX ILLUSTRATED will be sent to readers upon request.

"MEN WITH WINGS"

The winner of first prize in the "Men With Wings" Contest will not only get a free round-trip flight to Hollywood to meet movie celebrities like Fred MacMurray, Louise Campbell and Ray Milland (above), who star in the picture for which the contest is named, but will also visit the Douglas Aircraft Company plant to see giant airliners being constructed, as shown in top photograph.

BY ANSWERING ten simple aviation questions and writing a 25-50-word letter on the subject—"Who Is Aviation's Greatest Hero?"—you may be the one to win a round-trip airline flight to Hollywood, Calif., or one of the other 22 excellent prizes which will be awarded in the "Men With Wings" Contest being sponsored by Paramount Pictures and MECHANIX ILLUSTRATED. As an added treat to that of meeting famous motion picture stars at Paramount's Hollywood Studios, the winner of the airline trip

Below—A kit of materials for constructing a "Miss America" gas-powered model (less engine) is fifth prize in the contest

CONTEST
Features Many Prizes

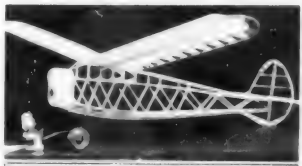
will also be taken on a tour of the Douglas Aircraft Company plant in Santa Monica, Calif., where he (or she) will be able to see some of the world's largest transport and military airplanes being constructed.

A complete listing of prizes and contest rules begins on page 80 of this issue, while the ten simple aviation questions are to be found in a box on this page. Read the rules carefully and then enter the contest, for you certainly don't want to pass up this opportunity of winning one of the numerous prizes that are being offered.

The contest questions are based on aviation facts and you can look up the answers in standard reference books, but it won't be half as much fun as seeing Paramount Picture's new all-Technicolor production—"Men With Wings"—at your local theater and learning the answers from its colorful and thrilling scenes.

Popular Fred MacMurray, Ray Milland and Louise Campbell are the stars of the thrilling motion picture, which records the feats of such famous flyers as Bleriot, first man to fly the English Channel; Alcock and Brown, first men to fly across the Atlantic; Lindbergh, first man to fly solo across the Atlantic; Wiley

To the winner of ninth prize in the contest will go a kit of parts for building the popular "Quaker Flash" gas-powered model plane (less engine) shown below. Right—The powerful Brown, Jr., miniature gasoline motor, completely assembled, will go to winner of seventh prize in the MI-Paramount "Men With Wings" national contest.



Here is a case where the number "13" is not unlucky, for the winner of thirteenth prize in the contest will get a kit for constructing a "Bay Ridge Mike" gas-powered model (less engine), which is shown covered and uncovered in photos above. Wingspan 48 inches.

CHECK ONE SQUARE FOR EACH QUESTION.

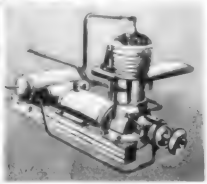
1. The first successful airplane flight was made by the Wrights on December 17, 1903 ☐ December 17, 1907 ☐
2. The United States Army had no airplanes before the World War Yes ☐ No ☐
3. When Alcock and Brown made the first successful flight across the Atlantic Ocean they landed in Long Island ☐ Newfoundland ☐
4. Colonel Charles Lindbergh started his famous trans-Atlantic flight from Orchard Beach, Maine ☐ Curtiss Field, L. I. ☐
5. The name of Colonel Lindbergh's monoplane was Winnie Mae ☐ Spirit of St. Louis ☐ Old Glory ☐
6. The early pioneers were more interested in the development of the airplane as a means of transportation than in its possible value as a weapon of war Yes ☐ No ☐
7. The first scheduled air mail planes were flown by U. S. Army pilots Yes ☐ No ☐
8. Commercial pilots must first serve as test pilots Yes ☐ No ☐
9. Corrigan flew to Ireland with the aid of a "gyro-pilot" and other modern direction-finding instruments Yes ☐ No ☐
10. Wing flaps were invented to make an airplane fly faster Yes ☐ No ☐

Name and Address

Age

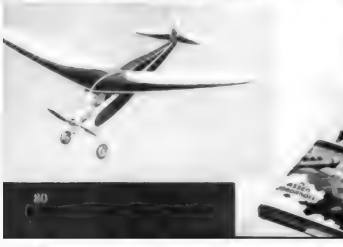
After checking off your answers to the above questions, tear out this coupon (or make a copy of it) and send it, together with your 25 to 50 word letter on the subject—"Who Is Aviation's Greatest Hero?"—to Contest Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

Above—Only a screw-driver is needed to assemble a miniature gasoline engine for model planes from this GHQ motor kit, two of which will be awarded as 11th and 12th prizes in the "Men With Wings" Contest. Left—The "Baby Cyclone" motor which will be awarded, fully assembled, as second prize. Left, below—This Atwood "Phantom" motor, ready to run, will be fourth prize.



Right, above—A "Gwin Aero" midget engine is sixth prize.

A kit for building a rubber-powered Guillow Endurance Model (left) will be awarded as 17th prize. The winner of third prize will receive a kit for building a six-foot Comet "Clipper" gas model (less engine), as shown below. A copy of "Your Wings", published by Funk & Wagnalls Company, will be awarded to winners of 18th to 23rd prize, respectively (below).



Post, first man to fly solo around the globe, thus helping you to choose a subject for your short letter on "Who Is Aviation's Greatest Hero?" as required in the rules listed on page 138. Of course, you may feel that some famous aircraft designer or test pilot is aviation's greatest hero, or that Rickenbacker, Luke, or some other World War ace deserves that rating. Write about any man you believe to be worthy of the title "Aviation's Greatest Hero," but be sure to explain why you selected him. Contestant's letters will be judged on reasons given for the selection made, and for sincere expression. Fancy language will not count. Write your entry with pen and ink or use a typewriter.

PRIZES

First prize in the big "Men With Wings" contest will be the free round-trip airline trip to Hollywood, California, as well as the added treat of visiting the Paramount Studios, to meet famous movie stars and visiting the Douglas Airplane Company plant in Santa Monica.

Second prize will be a famous World's Champion Baby Cyclone miniature gasoline engine for model planes and boats donated by Aircraft Industries of Glendale, Calif.

Third prize consists of a complete kit of parts for assembling a six-foot Comet Clipper gas-powered model airplane (less engine) donated by the Comet Model Airplane Company of Chicago, Ill.

Fourth prize will be an Atwood "Phantom" miniature gasoline motor donated by Phantom Motors of Los Angeles, Calif.

Fifth prize is a complete kit of parts for constructing a "Miss America" gas model plane (less engine), donated by the Scientific Model Airplane Company, of Newark, N. J.

Sixth prize consists of a Gwin Aero miniature gasoline engine donated by the Bunch Model Airplane Co., of Los Angeles, Calif.

Seventh prize is a Brown, Jr., Model B miniature gasoline motor donated by Junior Motors Corporation, of Philadelphia, Pa.

[*Continued on page 122*]

The sleek "Silver Streak" model shown below can be built from the kit which will be awarded to the winner of 15th prize.

New Army Rifle Shoots Five Times Faster Than Old Type

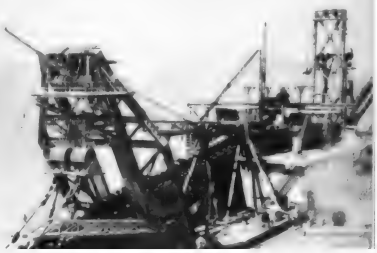
FEATURING a firing speed which is five times faster than that of rifles now in use, a newly developed .30 caliber U. S. Army rifle holds eight cartridges that can be fired by merely pulling the trigger, gas from the explosion immediately ejecting the empty cartridge and throwing another into firing position, thus eliminating the hand-operated bolt used on present rifles.

Model Midget Racing Auto Attains Speed Of 45 M.P.H.

POWERED by a one-cylinder motor of one-fifth horsepower, a model midget racing car constructed by Ralph Pickard, of Hawthorne, Calif., is said to attain a speed of 45 m.p.h. The model weighs seven pounds, has a 14-inch wheelbase and can run about two miles on the two ounces of gasoline carried in its tiny fuel tank. The body is made of pressed steel and the axles are tubular steel.

World's Largest Gold Dredge In Operation

CONSTRUCTED at a cost of about one million dollars and claimed to be the world's largest, a gold dredge recently placed in operation near Hammonton, Calif., handles 18,000 cubic yards of gravel daily. The mammoth dredge can dig successfully at underwater depths of 112 feet, its numerous buckets each scooping up 17 cubic feet of gravel at a time. A 1,200 horsepower electric motor powers the dredge's huge mechanism.



WHO INVENTED IT?

Two Austrian semi-postage stamps shown above picture inventors Kaplan, below, steam-turbine inventor, and above, Ressel, claimed by Austrian authorities as the inventor of the propeller.

Italy portrays Antonio Pacinotti on a postage stamp and claims that he invented the dynamo.

Zenobe Gramme, portrayed on a stamp of Belgium, is claimed by that country as the inventor of the dynamo!

Right—This statue in Washington, D. C., to John Ericson, in honor of his invention of the screw propeller.

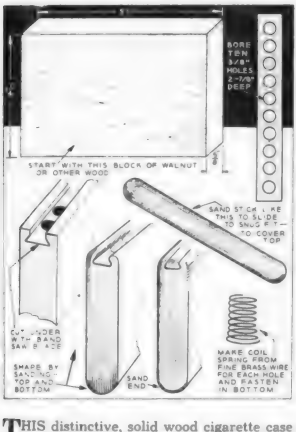
THE SERPENT'S TRAIL

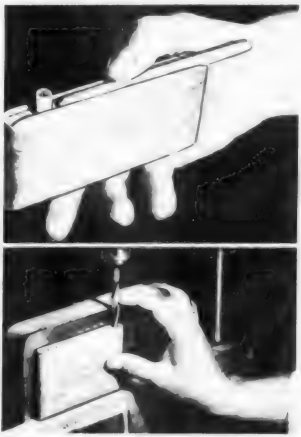
SINCE time began for man, the serpent, or snake, has been accepted by him as a symbol of greatness and might. In the Garden of Eden the snake meant evil; but in other parts of the world the snake was often looked upon as a good omen. Ancient carvings, old coins, all reveal various uses of various types of snakes; and the serpent was often worshipped in many sections of the world. Because the snake sheds his skin, some people have taken him as the symbol of rejuvenation and everlasting life! To the very ancient Egyptians the snake, or serpent was fully established in their religion as the sign of fertility.

Various positions of a snake were shown in their drawings and each position was supposed to be itself symbolic.

CRAFTS AND HOBBIES

SOLID WOOD CIGARETTE CASE





The cigarette case completed and ready for use is shown in the top photograph. Above is shown the case being drilled. Use a drill size only slightly larger than the cigarette diameter.

THIS distinctive, solid wood cigarette case is not much thicker than a leather case, and has a single sliding wood strip which locks the cigarettes in the holes. When you pull this strip slowly along, small brass springs cause the cigarettes to pop up about ½ inch.

Any wood can be used but burl or crotch grain will add to the case's beauty. Cut the block, and then bore the 10 holes evenly spaced as shown. With a sanding disc and No. 0 sandpaper, shape the ends, bottom and top. To flute the top so the slide will lock in place, stand the case on end and carefully undercut with a knife blade. A little additional sanding will be necessary. When fitted, push the slide in place and sand the top to shape.

The coil springs are made by wrapping fine spring brass wire about a nail held in the lathe chuck while you turn it by hand. This spring should be loose in the hole and about ¾ of an inch long when relaxed. Fasten the springs in the holes either by making the last turn or two quite small so that each can be held with a tack driven into the bottom of the hole, or by bending the last turn or two large enough to pinch the sides of the hole and thus anchor them once they are placed.

NEW USES for

by Fred A. Beard

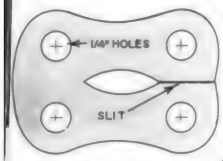
WHY not make a belt from that old pair of shoes you are about ready to discard? I know, I know, don't tell me—you don't see a long enough piece of leather in a pair of shoes to make a belt. That proves you have never read the ancient story about the queen whose share of the spoils of battle was a piece of land the size of an ox hide. By cutting the hide into one continuous thong, she encircled enough land to build a great city!

There is a vast amount of room to exercise your ingenuity in a pair of old leather shoes. Just offhand, if your supply of shoes holds out long enough, you can make several styles of belts, key-case, hatband, wristband, lanyard, coin purse, watch fob and other items.

And as for equipment, if you have an awl, a leather punch, a pair of scissors and a spike, you are armed to the teeth!

The link belt, for instance, is just as easy to make as it looks, to say nothing of being most handsome and comfortable. Cut out about sixty links, as in Fig. 1, punch four ¼-inch holes in each link, and put them together in succession as shown. Start with the buckle, and insert the loop at about the second or third link. The other end is finished with a plain piece, doubled, sewed and cut with two tabs on which are placed snaps. This belt will always fit because links can be added or removed.

A link belt can be made easily and inexpensively. Approximately sixty links are required depending upon length of belt.



LINK PATTERN
— ACTUAL SIZE —
60 PIECES REQUIRED

FIG. 1
SIMPLE LINK
— BELT —

REGULAR BELT BUCKLE

LOOP FOR TONGUE

ASSEMBLY

OVAL
UT OUT

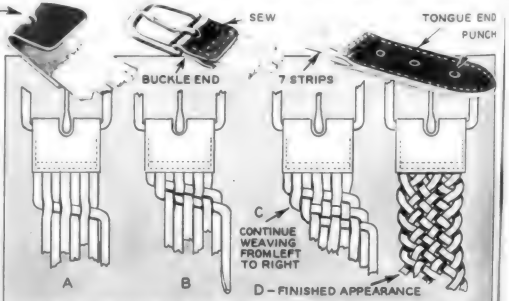


FIG. 2 PLAITED BELT – END DETAILS AND WEAVING ROUTINE –

Above is shown a sample link. Inasmuch as it is shown full size, it can be used as a pattern for tracing the outline on leather.

Right—When the weaving is completed for the plaited belt, it should be pulled from each end to straighten out the weave correctly.

OLD SHOES

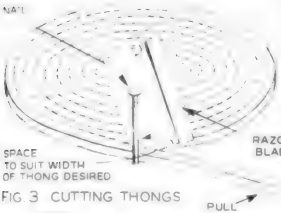


FIG. 3 CUTTING THONGS

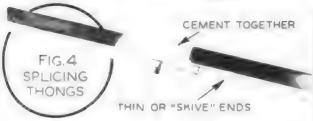


FIG. 4 SPLICING THONGS

When making any plaited work, first cut the leather into long, thin strips or thongs. Always cut the shoe leather into as large discs as possible. Force a razor blade into a board, and place a brad beside it at a distance equal to the desired thong width. After starting the thong with scissors, insert the end of it between the razor blade and the brad, as shown in Fig. 3, and pull gently until the disc is cut spirally to the center. With a little practice, you can "unwind" a leather disc as easily as if it were string.

Short lengths of leather thong may be spliced together by thinning (called *skiving*) the ends and cementing them together, as in Fig. 4.

To make the plaited belt, insert the buckle into the punched piece indicated in Fig. 2, fold back, insert the thong ends close together, and sew across it to hold the buckle and thongs in place. Begin to weave with the strand on the left-hand side, as in 2-A, and follow it, weaving alternately, with the very next strand, which has now become the left-hand strand. After a strand has been woven across, allow it to drop down on the right side to become the right-hand strand. Continue weaving, always from left to right, until the desired length is reached. Finish with a plain end, sewed across the thongs as at the buckle end. By pulling on the ends, the belt can be straightened out. It will be found to have

Above is shown the method of cutting a long thong from a round piece of leather. At the left is shown the method in greater detail. The width of the strip will be regulated by the distance of nail from blade.

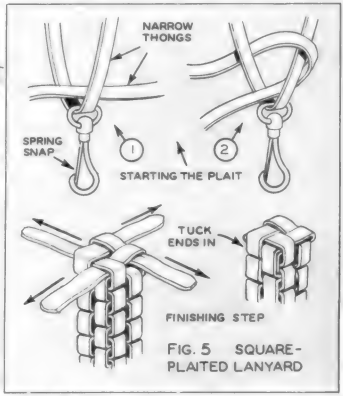
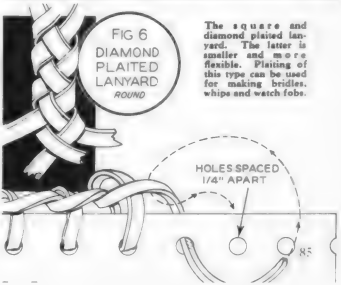
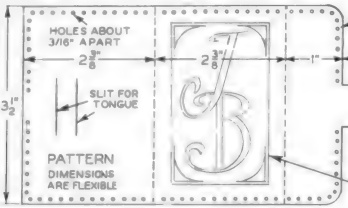


FIG. 5 SQUARE-PLAITED LANYARD



The square and diamond plaited lanyard. The latter is smaller and more flexible. Plaiting of this type can be used for making bridles, whips and watch fobs.

Cutting old shoes into thongs, links and discs. This pastime can be interesting as well as productive of useful articles.



considerable stretch, and allowance should be made for that before sewing on the tongue end.

Tooled leather articles are easy to make from old shoes. A No. 20 spike flattened on one end to a spoon shape, across which is made a diagonal cut with a hack-saw and polished, makes a good tool (Fig. 9). The other end of the spike should be ground down to a smoothly rounded point. Dip the leather a few times in water, wipe dry, and trace the desired design on it, using the blunt point on the tool. Then, with the spoon-shaped end, work the leather down over all areas *except* the design you have traced. As you work, the background will recede and the design will begin to raise, giving a relief effect to the work. If the leather dries before you are through tooling, wet the hand and pat the water into the face of the leather. When the leather dries, the design will be permanent, and years of carrying it in your pocket will not remove it.

Before lacing the edges of an article, be sure that any lining desired is cemented into place. With an awl, punch holes about ¼-inch apart and close to the edge. Bind the edge with as

[*Continued on page 118*]

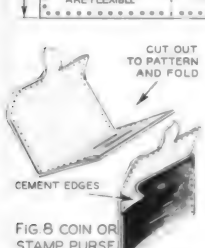


FIG. 8 COIN OR STAMP PURSE

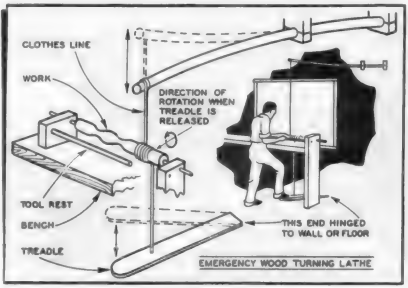
The method of laying out and making a coin or stamp purse. Before lacing the edges, the lining should be cemented in place.

FIG. 9 LEATHER WORKING TOOL

A spike flattened on one end makes a suitable tool for working leather. The flat end should be spoon-shaped and the other end brought to a round point.

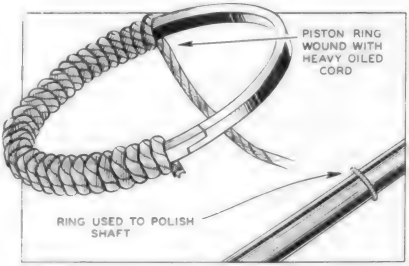
Easily Constructed Lathe Does Simple Turning Jobs

WHEN a simple turning job is necessary and no lathe is available, the arrangement shown at the right will furnish a satisfactory substitute. A pole approximately eight feet long and 1¼ inches in diameter is fastened to the ceiling at two points, as shown. A piece of clothesline is connected from the free end to a foot treadle. Two or three turns of the rope around the work will be sufficient to give the necessary traction. A piece of iron pipe serves as a tool rest.



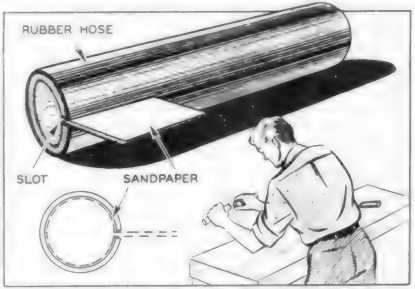
Old Piston Ring Polishes Shafts

A SATISFACTORY shaft polisher can be made from an old piston ring wrapped with twenty to thirty turns of heavy cord. The cord then is soaked in oil and slipped over the shaft. As the shaft revolves, the cleaner will move back and forth, keeping it clean and polished. One of these devices will keep a shaft free from dirt and rust for an indefinite period.

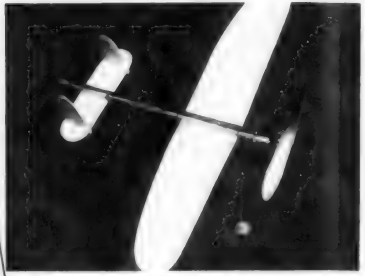


Simple Cleaner Made From Hose

A SIMPLE device for cleaning battery terminals or anything round, can be made quickly and easily from a short piece of rubber hose and a sheet of sandpaper. A slot is cut in the hose and the sandpaper is placed around the inside with the ends protruding through the slots. The hose then is slipped over the object to be cleaned and rapidly rotated.



Build the MI



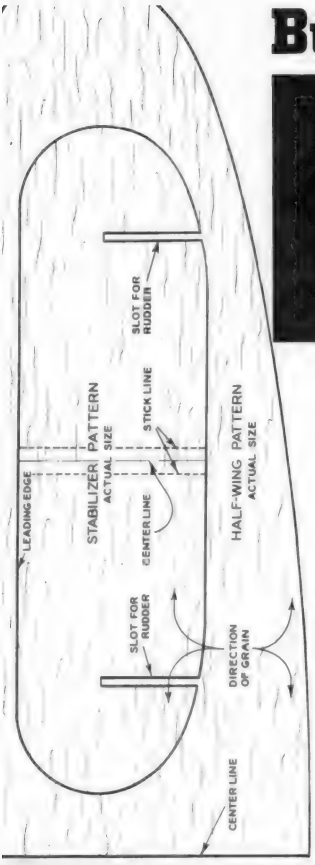
Constructed from materials costing only a few pennies, the twin-rudder "Sky Flea" makes steady flights of 300-400 feet.

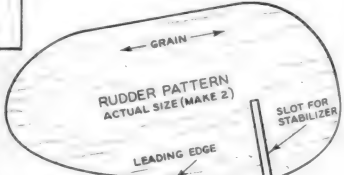
by John L. Scherer

REQUIRING less than one hour to construct and involving the expenditure of only a few pennies for materials, the MI "Sky Flea" will repeatedly make flights of from 300 to 400 feet under average air conditions. The plans for the wing and tail surfaces are full-scale, simplifying the construction problem.

The fuselage or motor stick consists of an 11½-inch length of ⅜x¼-inch balsa stick, sanded to a smooth finish. Cement a propeller thrust bearing to the upper nose end of the motor stick and wind thread tightly around the stick and bearing, as shown in sketch. Cover the wound thread with model cement and allow to dry thoroughly

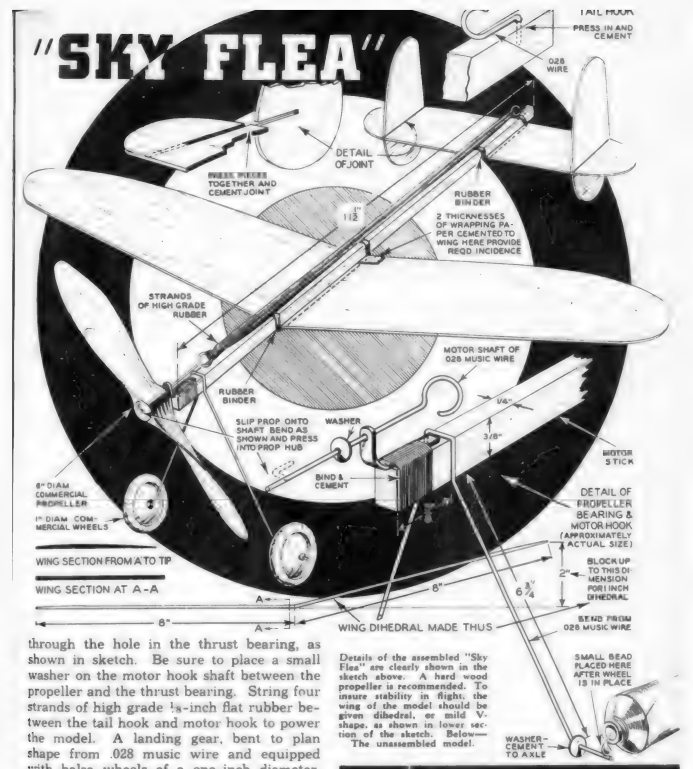
Bend a piece of .028 music wire to form a tail hook and insert it into the upper rear end of the motor stick, dabbing model cement over the spot where the hook pierces the wood. Secure a hard wood propeller of a six-inch diameter, pierce its hub with a motor hook, bent to plan shape, and insert the hook





The sketches above and at right show full-scale patterns for making the "Sky Flea's" wing (two half-sections of equal size), stabilizer and rudders. Balsa sheeting of a ⅛-inch thickness is used and should be sanded smooth to reduce friction in flying through air.

"SKY FLEA"



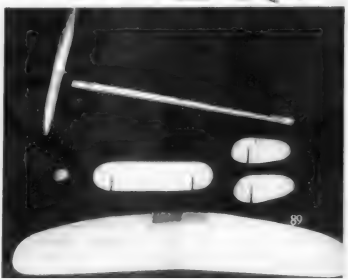
through the hole in the thrust bearing, as shown in sketch. Be sure to place a small washer on the motor hook shaft between the propeller and the thrust bearing. String four strands of high grade $\frac{1}{8}$-inch flat rubber between the tail hook and motor hook to power the model. A landing gear, bent to plan shape from .028 music wire and equipped with balsa wheels of a one-inch diameter, completes the fuselage assembly. The legs of the landing gear should be $6\frac{3}{4}$ inches long from the bent point at the fuselage.

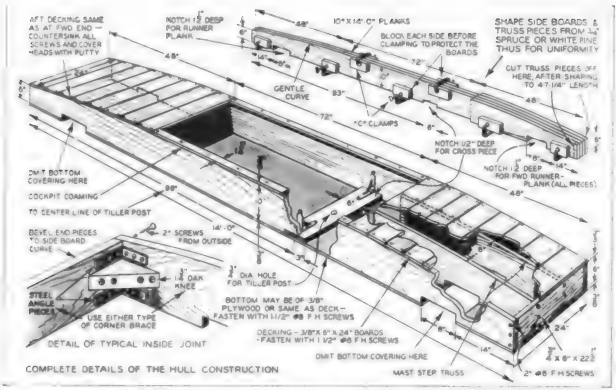
Secure several sheets of standard 18-inch balsa sheeting, 3 inches wide and $\frac{1}{16}$-inch thick and cut out the two 8-inch-long wing halves, stabilizer and twin rudders, using the full-scale plans for a pattern. Sand the sheeting smooth.

A dihedral, or mild V-shape, should be

[*Continued on page 120*]

Details of the assembled "Sky Flea" are clearly shown in the sketch above. A hard wood propeller is recommended. To insure stability in flight, the wing of the model should be given dihedral, or mild V-shape, as shown in lower section of the sketch. Below—The unassembled model.





BUILD "ICE-SPRITE"

Front view of the four-runner "Ice-Sprite" showing the bow-shaped stays. The drawing above shows hull construction details.

THE four-runner iceboat is here for those who demand the most up-to-date innovation in this thrilling sport.

The four-runner "Ice-Sprite" design has several features embodying greater safety. With four-cornered support, it rears up and hikes less. Moreover, the hull and sail does not tip forward or backward, as do other types. Because the position of the sail is stationary, capsizing is less likely to occur.

In straight going, the rear runners track in the cuts of the fore runners. Thus with two tracks instead of three, friction is reduced and more speed is possible. As it weighs only 210 pounds, it sails and rides easily with added comfort from two runnerplanks. The cockpit is large enough to accommodate two or three persons.

"Ice-Sprite" will not spin. Designed with even balance, it requires no anti-capsizing skids on the runnerplank ends. The hull is symmetrical so that it can be steered in front equally well by reversing the direction of the runners and stepping the mast reversed on the after deck. The sail area is only 75 square feet.

Build the scow-shaped hull first. Straightforward and simple construction is used throughout and a glance at the hull drawings

by J. Julius Fanta

will quickly show the necessary details and dimensions to be observed. Any good grade lumber may be used for the 14-foot side boards but ¾-inch clear white pine or spruce is recommended.

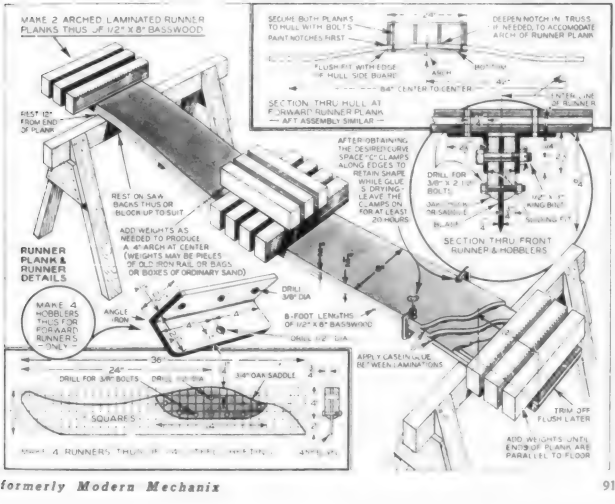
The two 14-foot boards and the two 48-inch truss members which brace the mast step should be clamped together as shown and shaped and mortised as a single unit. This ensures uniformity. The notches for the runnerplanks are 1½ inches deep to take the planks flush.

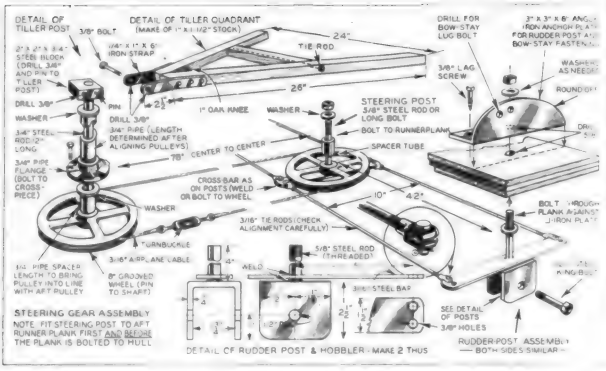
Put in the ¾x6x22½-inch end boards and brace the corners either with oak knees or with corner irons as shown in the detail sketch. A further cross member of ½x6-inch stock is put in to stiffen the structure and to serve as a base for the tiller post.

Leaving entrance for the runnerplanks, cover the entire bottom with ⅜x6-inch boards or ⅜-inch plywood. Now drill through the cross-member and bottom for

The four-runner ice boat is well balanced and seldom rears up. Below—Sketch showing how to make runners and laminated, bent runner planks.

A FOUR-RUNNER ICE BOAT





The steering gear assembly is simple, but strong. By crossing the cables, the tiller action will be positive, as in an auto.

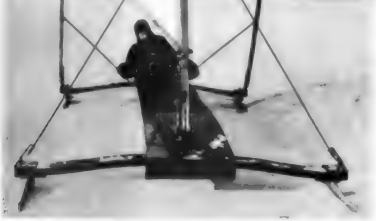
the ¾-inch diameter tiller post. The mast truss boards are next fitted and screwed to the front end board and to the bottom. This truss serves to distribute the down pressure of the mast and should be spaced as shown in the drawings (page 90). Lay the deck in the same manner as the bottom and fit the cockpit coaming strips, which are made of 1¼-inch plywood, ⅜-inch thick. The decking, if planked, should now be filled along the seams with a mixture of putty and white lead and the entire hull sanded down before applying three coats of either varnish or paint. Pay particular attention to paint the runnerplank notches to prevent rot at these points, eliminating trouble later.

The runnerplanks are now constructed. They are exactly alike and are built up of three laminations of ½-inch basswood, as shown in the drawings on page 91, and held together by casein glue. It should be mixed with cold water to a heavy consistency. When the planks have been arched to the correct curves clamp them with "C" clamps and allow at least 20 hours for drying before removing the clamps.

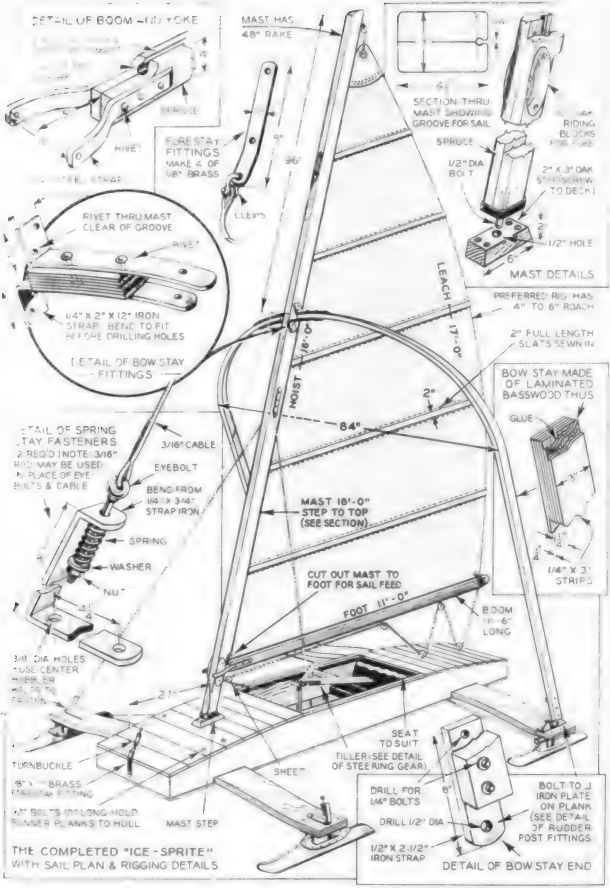
The planks may be attached either with ½-inch bolts through the deck as shown or with corner plates bolted through planks and side boards. Either method is satisfactory but before bolting the runnerplanks in place the runners, front hobblers and the steering gear elements should be made. It will be noticed that two sets of front hobblers are required and two pivoted hobblers or rudder posts support the aft or steering runners.

Make the 4 identical runners to the plans given, cutting them from ¼-inch steel sheeting and then drilling for the oak saddle pieces and for the ½-inch pivot or king bolts. This work is best taken

[*Continued on page* 121]



This close-up of the hull shows the arched runnerplanks which absorb the shock of traveling over rough ice. Note the springs on mast-stay fittings, another practical innovation.



This drawing shows the completed "Ice Sprite" and clearly indicates the sail plan and numerous rigging details. Runners and metal parts should be finished with aluminum paint to prevent rust. Seat and backrest are left to builder's discretion.

Northern Snowshoes

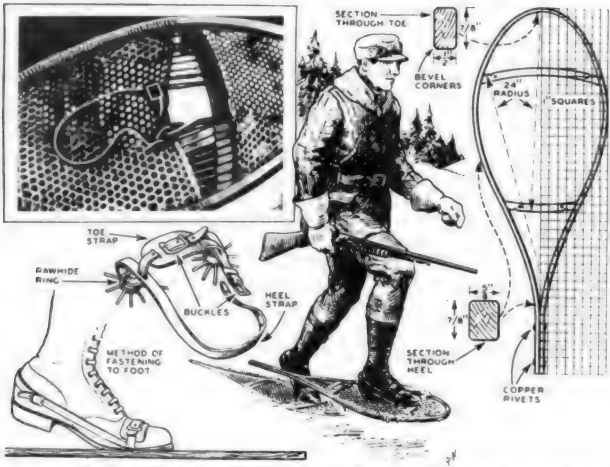


Fig. 1. Sturdy and durable, these snowshoes are ideal for hunters and trappers. Photo shows completed snowshoe, while below it is the toe strap detail. Frame is bent according to dimensions given in squared pattern and secured with copper rivets.

by Hi Sibley

TRAPPERS, hunters, winter hikers and outdoor men in general will find these simple snowshoes just the thing for negotiating the landscape when the snow is piled neck deep all over the scene. The design was taken from a pair of genuine Canadian snowshoes, so you can be sure that you will be constructing the real thing.

Construction presents no real difficulties and cost has been reduced to a minimum. Some care will be required, however, in bending the toe of the frame, and in getting the rawhide lacing tight. In fact, the success of the project depends largely upon these two factors.

Select two straight-grained pieces of hickory 8 feet long and ⅞-inch wide at the center, which is to be the point of the toe. Begin 32 inches from the ends, and plane one side only, which will be the inside when the frame is bent, as shown in Fig. 2.

After the corners are beveled the frame members should be thoroughly steamed before attempting to bend them. This can be done by placing them in an 8-foot section of old rainspout or a long box, tying a cloth with small vent over one end and inserting the spout of a tea kettle in the other as shown in Fig. 2.

The outer end should be elevated a foot or so, and steaming continued for at least an hour.

Prepare a form around which the sticks are to be bent, laid out as shown in the squared chart in Fig. 1. This can be nailed to a cellar or garage door, where it is exposed to the sun. Do not attempt to bend to the final shape all at once, but work it around gradually to ease the strain.

Thwarts, or cross-members made of hickory, as shown in Fig. 2, should be in-

Are Easy To Make

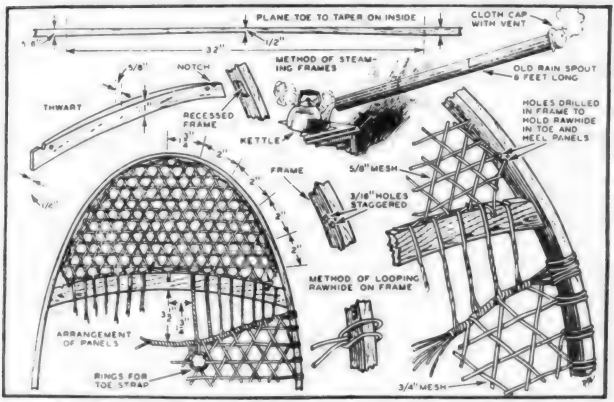


Fig. 2. The various steps in the bending of the snowshoe frames and weaving of rawhide thongs are illustrated above. Bend the frames slowly so that they do not break and draw the thongs as tight as possible. The detail at extreme right shows the manner in which thongs are secured to thwart and frame, and in heel and toe sections. Frames are protected with linseed oil.

stalled just before the heel ends are brought together and riveted. Note that the ends of the thwarts are set in mortises or recesses in the frame, chiseled about ¼-inch deep. Secure the heel ends together with copper rivets or $\frac{3}{16}$-inch brass bolts located, as shown in Fig. 1.

The frame is now ready for lacing. For the toe panel use strips of rawhide about ⅛-inch wide. Fig. 2 gives the general arrangement of the rawhide, but do not expect the finished job to have any such geometric regularity. The utility will not be affected.

Beginning at the toe drill a pair of $\frac{3}{16}$-inch holes, staggered and about ¼-inch apart, and 1¾ inches on each side drill two more holes with four more pairs down each side, spaced 2 inches apart. These are for anchoring the rawhide loops which hold the lacing.

Each pair of loops along the edge of the frame should be drawn as tight as possible. Tie each pair separately so that when they are all completed, the edge of the front section of the frame will consist of individual units. The heel panel is laced in a similar manner.

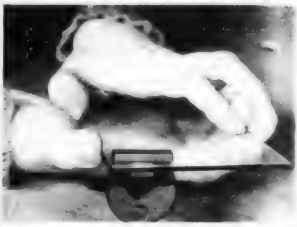
For the central panel which supports the foot directly, use $\frac{3}{16}$-inch strips of rawhide, arranged as shown in Fig. 2, with an open space in the center just above the user's toe, and two rawhide rings for receiving the foot strap. Note that in the central panel the thongs are looped over the frame.

No matter what the finished appearance, the snowshoes will perform satisfactorily if all the thongs are taut, but if they are loose the shoes will be very difficult to use. A toe-and-heel strap is made as shown in Fig. 1 and looped through the two rawhide rings.

A little practice will quickly give you the knack of walking on snowshoes. When moving forward the shoes are dragged close to the snow, rather than lifted, as in the case of skis. One shoe is advanced to the point where the heel section of the front shoe fits around the side of the toe section of the rear shoe, and so on. Turning is a matter of swinging one shoe completely around in the opposite direction and following it with the second shoe, which is brought up alongside the first. You'll soon acquire all the tricks in the trade.

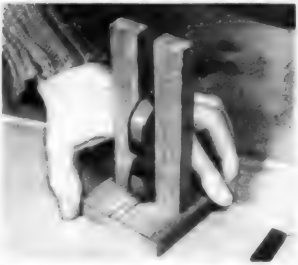
EXPERIMENTS

Magnets made of the new aluminum-nickel-steel alloys show amazing lifting power. They are capable of holding as much as fifty times their own weight in soft iron. These magnets are finding wide application in radio loudspeakers where they provide considerably greater power and improved tonal quality.

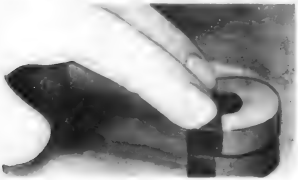


So powerful are these new magnets that they are capable of exerting their influence even though they are separated a considerable distance from another piece of magnetic metal. Here a small magnet is held in defiance of gravity by its keeper separated from it by the thickness of a piece of glass.

The repulsion powers of these magnets are so great that the magnet at the right is backing up as the one on the left is pushed forward. A wooden rail is necessary to keep the magnets from turning to bring unlike poles together.



A small wooden frame prevents the magnets from bringing their unlike poles together, and thus permits the lower magnet to lift the upper one clear of it. It will hold the position shown in the photograph above for an indefinite period.



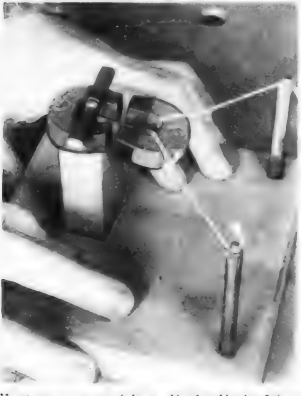
Like poles of a magnet repel each other. When the north and south poles of the two magnets are placed together as shown, the top magnet will be thrown upward several inches from the lower one when the fingers are suddenly removed.

If a small table with a glass top is made as shown, many hours of fun can be had by marshalling small steel balls about, with the help of a magnet held underneath. Inasmuch as the balls immediately become magnetized, they tend to arrange themselves in definite magnetic patterns.

WITH MAGNETS

The power of these new magnets is so great that a long string of steel balls can be lifted intact. To accomplish this, the balls should be lined up in a small grooved board as shown above.

As many as ten steel blocks can be balanced on one pole of these new magnets if the experimenter's hand is very steady. The ends of the blocks must be perfectly square to make this experiment a success. Be sure that the face of the magnet on which the pieces are piled, is perfectly level and steady.

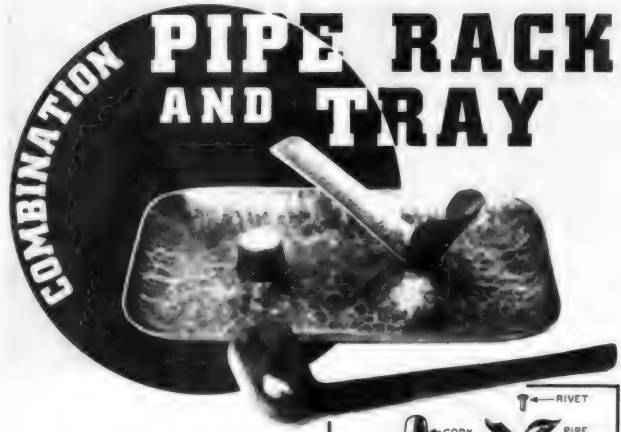


The more powerful a magnet is, the more it will tend to point to the magnetic north pole. Ordinary magnets do not show a very pronounced motion, but the new alloy magnets fully demonstrate the action when at the end of a string as shown.

In this beaker of water a small piece of steel is prevented from sinking by the magnet held near the outside of the glass. If very thin pieces of sheet steel are used, the magnet can be held as far away as one inch with the same result.

Here is a magnet suspended on nothing but thin air. It is attracted to the anchored magnet with such force that gravity does not force it to fall, even though it is separated from the stationary magnet by approximately a quarter of an inch.

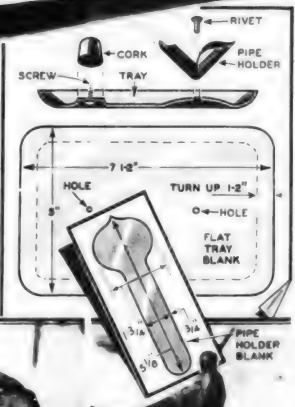
COMBINATION PIPE RACK AND TRAY

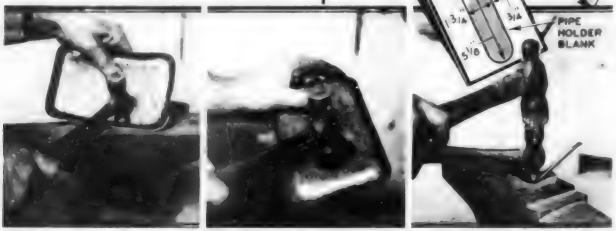


THE construction of this tray illustrated will not only give the pipe-smoking craftsman something interesting to make but will prove to be useful for decorating a reading table or desk. The tray itself is of 18 gauge soft sheet copper, 5" wide by 7½" long, and is raised to a depth of about ½".

After the tray has been shaped and trued up, turn the piece over and with the ball end of a hammer, raise a mound about 1¾" in diameter in one end, upon which the pipe holder will rest. Raise another mound about ¾" in diameter in the other end. To square

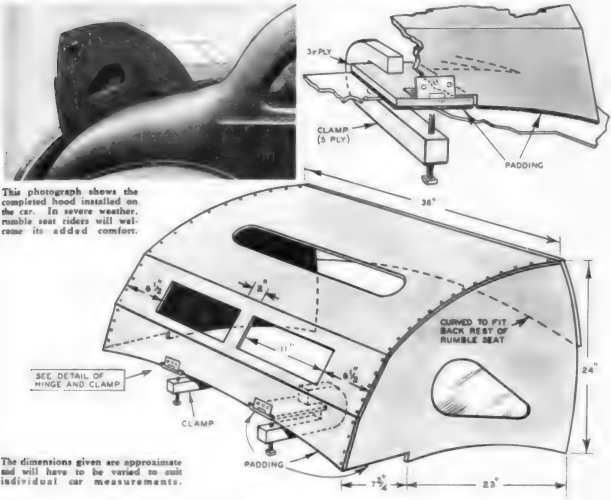
[*Continued on page* 118]





Easily Made Cover Protects Rumble Seat Riders

This photograph shows the completed hood installed on the car. In severe weather, rumble seat riders will welcome its added comfort.



The dimensions given are approximate and will have to be varied to suit individual car measurements.

IN SEVERE weather, rumble seat riding at times becomes very uncomfortable. However, the rumble seat cover shown above will eliminate all discomfort caused by weather, and can be made easily and inexpensively by any car owner. Because the dimensions vary according to car and model, the measurements given above are approximate and will have to be changed to suit individual conditions. When fitting the cover to the car, be sure to make all joints tight enough to prevent rain from coming in, but, at the same time, some provision for adequate ventilation should be provided. If there is any possibility of exhaust fumes coming into the compartment from the under part of the car, the hood should not be used until this condition is completely corrected.

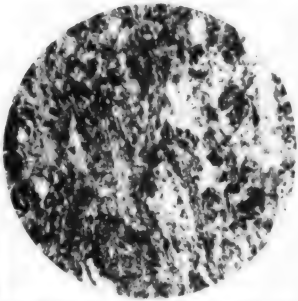
Plywood or prestwood is used for the sides, back and top. The material for the windows can be taken from a pair of old side-curtains, or can be purchased at almost any auto supply store. They are fastened in place with glue.

Paste Cleans Reflectors

ALMOST all headlight reflectors become dirty after a few months of use. They can be cleaned and polished easily and without damage or scratching by using ordinary toothpaste as the cleaning material.

MINERALS MAKE COLORFUL

A circular pill box with sunstone specimen mounted on a cork pyramid in the center, for low power examination with strong reflected light. The box interior is painted black.

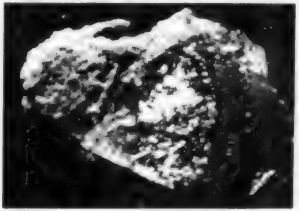


A professional slide of chlorite schist prepared as a thin section for study by transmitted light. Such a slide reveals the details of rock structure.

IF BEAUTY is a quality to be sought for its own worth, then beautiful objects are to be desired whether or not they possess other values. Hence the amateur microscope enthusiast often searches for materials to delight the eye regardless of other considerations, and among the many sorts of natural objects thus prized minerals easily head the entire list, for in minerals beauty of color and beauty of form often go hand in hand and frequently require magnification for their full appreciation. In most cases the technique is very simple and quite naturally the subject is a favorite one with many an owner of a microscope. Some examples will make these points clear.

The pillbox mount of mineral specimens is designed for low power examination by reflected light. From your druggist, secure a number of small pillboxes preferably of the cubical type and some cork stoppers or sheet cork. For each box construct a small pyramid of cork and affix by its base to the bottom interior of the box with balsam. Paint the cork and box interior black. The pyramid should raise the mineral specimen about halfway up from the bottom of the box. Cement the mineral to the apex of the cork, label the box lid appropriately, and keep stored with the lid on when not in use.

Many minerals are suitable for these mounts. Among them are: crystallized specimens of native gold, silver and copper; very small examples of diamond; asbestos fibers of several types; pieces of precious opal and opalized wood; and crystal groups of azurite, malachite, cuprite, garnet, mimetite, vanadinite, sunstone, gypsum, galena, halite, fluorite, calcite, jamesonite, mordenite and many others. Small clusters for box mounts may be obtained from dealers at trifling cost.



Photograph of a pill-box mount of sunstone by reflected light. The crystals that appear as white in the photograph, actually are all the colors of the rainbow.

Examine the specimens with the lowest available magnification. If you have a standard laboratory instrument, unscrew the front combination of the low power (16mm) objective, thus converting this lens into one of 32mm, coming to a focus at a much higher level and reducing the power from 10X to 4X. With a 5X eyepiece, this means a total reduction from 50X to 20X, the ideal magnifi-

MOUNTS FOR THE MICROSCOPE

by Julian D. Corrington, Ph.D.

Crystals of potassium ferricyanide photographed with ordinary light. Compare this with the photograph at the right.

The same slide under polarized light, showing greater detail. Unfortunately this photo cannot reveal the beauty of colors.

cation for this work. A lens recently placed on the market and known as a bifocus objective is designed to make this change instantly by the flip of a lever.

One can purchase a separate 32mm or 48mm lens, if desired, and screw this onto the microscope nosepiece for low power work, and it is also possible to secure especially long oculars with a power of only 2X. For miniature models, in which the objective cannot be taken apart, special low power eyepieces are available; in the case of one popular model the resulting magnification is the desired 20X.

Illumination is a most important consideration in this work. It must be strong and directed down into the box mount from above, either by placing a lamp source correctly, or by using a small mirror, such as that for a lady's vanity case or compact, fastened to the microscope tube with wire or brass collar, and tilted to direct light rays downward. Many amateur microscopes have detachable substage mirrors which can be removed and plugged in above the stage for reflected lighting purposes.

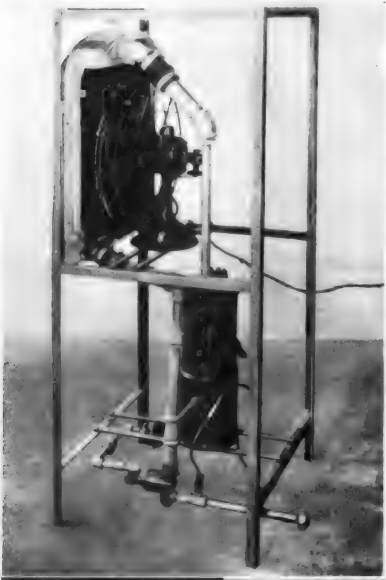
Mineral specimens may also be mounted on slides, a method preferred by many. Obtain some small bone embroidery rings and cement one of these to a slide. Cut a circular piece from black photomount paper so that it will fit snugly within the ring and cement this to the slide also. Then paint the ring black. Cement in the mineral crystals and warm the slide to drive off all moisture, and seal on a circular cover glass of the proper size. Note that the deep-well slide thus made contains air and is not to be filled with balsam.

It is good practice to "flame" the cover glass first; hold with a forceps and pass rapidly several times, both surfaces, through the apex of a flame such as that from a bunsen burner or alcohol lamp. This drives off all traces of moisture and is especially necessary in humid climates. Should moisture be present within the well, it will collect as a fine mist on the under surface of the cover, which then must be removed, the well dried thoroughly, and a new cover applied.

Various sands make interesting deep-well mounts. Prepare the black well as before. Sprinkle a small amount of a given sand upon

[*Continued on page 124*]

Automatic Hot Air Heater



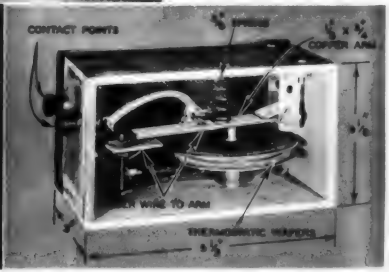
CAPABLE of maintaining a comfortable room heat in zero weather, this automatic hot air heater is an ideal unit for the small shop or office. It is efficient and economical in operation, and, with thermostatic control, requires no attention other than adding to the water supply in the radiator from time to time.

The mechanics of the installation can be seen in the photographs. The heating unit is the familiar coil-type gas heater. This heats the water, which, when hot, rises to the top of the radiator. A fan mounted behind the radiator sends a warm current of air out into the room. The water returns to the heater and continues to circulate. A pipe leading from the return water line connects to a thermostat, the thermostat checking or turning on the gas according to the heat of the water.

The dimensions given are a fair standard, but can be varied to suit. It can be seen that the width of the angle-iron framework must be made to fit the width of the car radiator selected for the job. The coil heater is of medium size and costs approximately five dollars.

Above—The completed heater just before the sheet metal covering is fastened in place. The thermostat for turning the fan on or off is not shown in this photograph. The fan should have 12 or 15-inch diameter blades.

Right—This is a home-made thermostat used for turning the electric fan on or off. With the exception of the wafers, all the parts are of the type found in the average home workshop. The wafers are the type that can be purchased at most electrical or hardware stores.

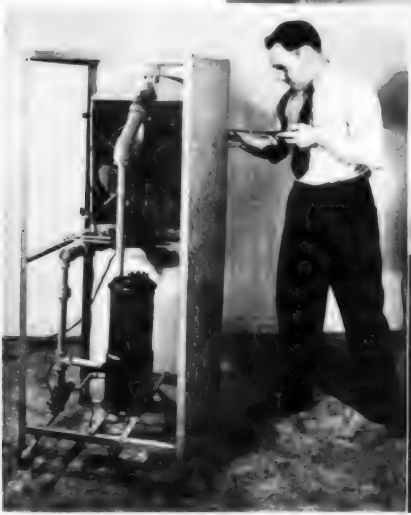


for Shop or Office

by Robert Gregg

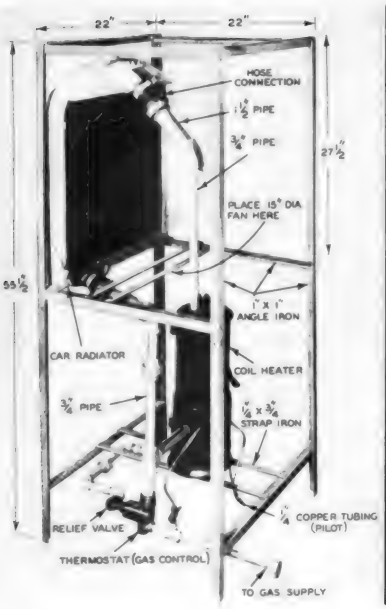
The fan should be about 12 to 15 inches in diameter. If this is not available, two smaller fans can be used. The thermostat is a standard type for controlling the flow of gas when used for heating water. It can be set for any temperature from 100 to 160 degrees, and will control the flow to maintain the temperature for which it is set. A setting of about 150 degrees is recommended for the unit shown.

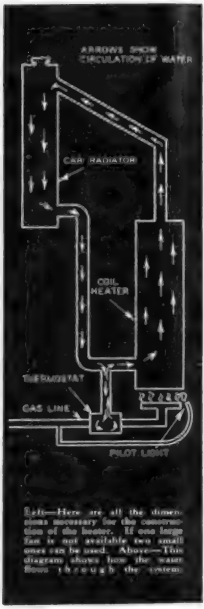
A second thermostat controls the fan. This type of thermostat can be purchased at a nominal cost or made as shown in the photograph. Two thermostatic wafers are re-



Above—The finished heater covered with sheet metal. The top should be removable so that water can be added to the radiator when needed. In most locations it will not be necessary to cover the back. One or two coats of paint of a color to match the rest of the room will greatly improve its appearance.

The heater should be fitted with a stack so that the burned gas fumes will be led outside. Bolts and nuts can be used to hold the outside covering in place.





Left—Here are all the dimensions necessary for the construction of the heater. If one large fan is not available two small ones can be used. Above—This diagram shows how the water flows through the system.

quired. These are the type used in chicken brooders, and are obtainable at any hardware store handling farm supplies. The cost is about twenty cents. The disks are mounted in a small wooden or metal box so that they will actuate a metal arm and thus open or close the circuit to the fan. It will be necessary to experiment a little with the spring which holds the arm down on the wafers to determine the pressure required for the thermostat to close at a comfortable room temperature.

Where expenses must be considered, the thermostatic controls can, of course, be eliminated. If this is done, the fan runs continuously, while the gas pressure is adjusted from day to day to meet varying temperature conditions. To improve its appearance the bare framework of the unit should be covered with sheet metal, with a removable metal top to permit adding water to the radiator. It will probably not be necessary to cover the back, because this is usually against a wall and out of sight. The heater should preferably be fitted with a stack so that gas fumes can be carried to the outside. If used in any location where a stack would prove unsightly, the heater can be fitted with a flue cap filled with steel wool, the same installation as used on kitchen stoves.

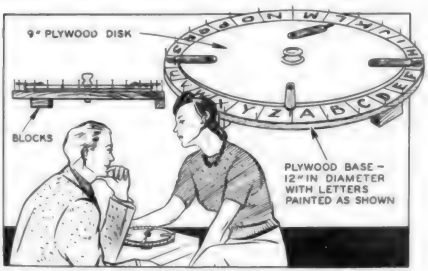
This type of heater is particularly applicable for places requiring rapid heating facilities. If it is turned off during the night, almost immediate heat will be obtained the next morning when it is turned on, thus eliminating that long no-heat period found in some heaters.

Shuffle A Deck Of Cards With One Hand

A DECK of cards can be shuffled easily with one hand if these directions are followed closely: Divide the pack into two parts and place them on the edge of the table. With the hand over the two piles as shown in step 2, raise the front edges of the piles with the thumb and riffle both halves at the same time. If the preceding steps have been carried out correctly the cards should fall into perfect dovetail order. The pack must overlap the edge of the table about one inch for best results, and both halves should be riffled at the same speed to obtain an even dovetail. After the cards are dovetailed, shove the two piles together, even them up and repeat if desired. After a little practice the entire operation will be completed easily and quickly.

New Letter Game Adds Enjoyment To Parties

THIS exciting word game can be played by small or large groups and never fails to excite interest. Any number of players from two up can take part, and the more the merrier. One player spins the wheel and when the pointer or pointers come to a stop, the first player to give a word containing the letter or letters pointed to, wins the spin. The first player to score ten pins is the winner. The four pointers are fastened in place with screws and are adjusted so that they can be turned away from the edge, thus reducing the number of necessary letters in the words to be selected. As the players become more skillful, more pointers can be used. This game is especially interesting to cross-word puzzle fans.



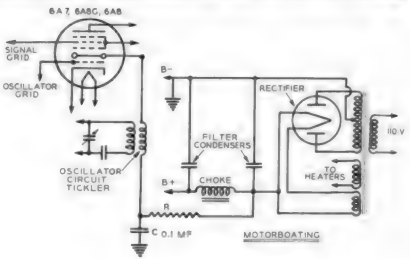
RADIO SPARKS

Motorboating Is Easy To Eliminate

MANY radio receivers motorboat when a strong signal is received. Under these conditions, the set sounds as though the station were broadcasting machine-gun fire. When a comparatively weak station is tuned in, the set works perfectly and all search for trouble is in vain.

Trouble of this sort has often been found to be caused by changes in oscillator voltage with signal. When a strong signal is tuned in, the current drain of the set rises and the B voltage falls as a consequence. The reduced B voltage on the oscillator plate changes the oscillator frequency enough to detune the station, and the B voltage rises again. The rise and fall of signal strength is the motorboating.

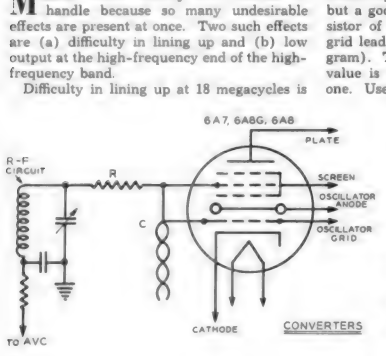
Fortunately, the remedy is simple: disconnect the B-plus lead to the oscillator anode and connect it through a separate resistor to the high-voltage side of the filter choke, as shown in the sketch. Bypass the resistor to ground through a condenser (C). The value of R is easy to determine: increase its value until the voltage at the oscillator plate is 200 volts, when measured with a high resistance voltmeter. The usual 20,000-ohm resistor in the oscillator anode circuit should be removed.



How To Improve Operation Of Converter Tubes

MIXER tubes usually are difficult to handle because so many undesirable effects are present at once. Two such effects are (a) difficulty in lining up and (b) low output at the high-frequency end of the high-frequency band.

Difficulty in lining up at 18 megacycles is caused by a number of complex phenomena, but a good remedy is to connect a fixed resistor of about 500 ohms in series with the grid lead to the tube (resistor R in the diagram). This value is not critical, and a small value is often more beneficial than a large one. Use the smallest valve that gives satisfactory results.



Low sensitivity at the high frequency end of the high frequency band can be compensated by connecting a small capacitance from the grid of the oscillator section to the grid of the signal section, as shown by C in the diagram. This condenser should consist of two short lengths of wire about three inches long, twisted together. Tune in a signal at about 18 megacycles and start with a two-inch length of twisted wire. Clip off a little at a time until sensitivity is at a maximum.

2nd PRIZE

4th PRIZE

3rd PRIZE

FIRST PRIZE: "Suspicion" by W. D. Barkley, Baltimore, Md. Taken with 3 ½x4 ½ Graflex at f.22 and 1 sec. No. 10 flash bulb. S. S. Pan film. **SECOND PRIZE:** "Xmas Night" by Fern France, Hiawatha, Kan. Taken with 3 ½x4 ½ Graflex at f.6.3 and 1/10 sec. on S. S. Pan film. Two photofloods. **THIRD PRIZE:** "Acrobats" by E. A. Roberts, Middletown, Conn. Taken with 5x7 view camera on Super Pleachrome film at f.16 for 10 sec. Window lighting. **FOURTH PRIZE:** "Magic Carpet" by John T. Moore, Seneca, S. C. Taken with an Ica on S. S. Pan film at f.11 and 1/20 sec. with K-2 filter. (Two negatives superimposed.) **FIFTH PRIZE:** "Wash Day" by Charles A. Dean, Stockton, Calif. Taken with 1A Kodak on Verichrome film at f.11 and 1/25 sec.

MONEY FOR YOUR PICTURES!

Get busy with your camera and send in unusual pictures of people, animals, machines, trains, airplanes, etc. Each month we will pay $15 for the best picture received from readers, $10 for the second choice and $5 each for the next three selections. Prints should be glossy, as large as possible up to 8x10 inches (although a small, sharp photo is more desirable than a big, fuzzy one) and should be accompanied by the following data: make and size of camera, type of film, and lens aperture and shutter speed, and lighting conditions. Wrap all prints carefully and include postage. Address contributions to Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York.

DRESS UP YOUR PRINTS

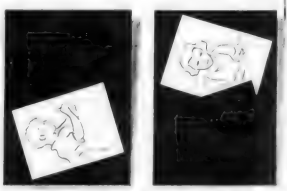
The novel mask used here was merely a negative made by photographing a sheet of corrugated paper of the type used for show-window dressing.

This border was made by photographing a cardboard portrait mount. Other materials, such as wallpaper, buckram book cover, etc., may also be used.

IF YOU want your pictures to stand out from the ordinary, here is an interesting and practical method of doing it. The "solon" type of photographer has used a variation of it for years, and so has the professional portrait maker. How is it done? *Dress up your prints!*

Masking offers the easiest and least-expensive method because with a paper or film mask or two, and nothing else, your contact or enlarged prints can be given the desired touch of individuality.

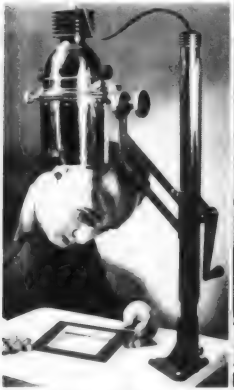
Quite likely you have been making your prints with an ordinary, square-cornered paper or metal mask, as has most everyone else. As a variation, use round corners. The black paper with which cut films are packed, if given a thin coat of shellac or varnish, is an excellent material from which to cut masks. A practical method is to cut a card-



Double printing masks, cut out of black paper as shown above, permit two pictures to be combined on a single large sheet of printing paper.

Simple paper "masks" lend decorative note to unmounted pictures.

by Kenneth Murray



Above: Masks for enlarging should be attached to sheets of clear glass, which are then placed over the enlarging paper on the easel. Above, right: This simple but effective masking arrangement was adapted from the method used to decorate newspaper halftones. Narrow strips of gummed red paper were attached near the edges of a sheet of glass, which was used under the negative.

board template on your paper trimmer, lay it on the black paper and use it as a guide

Above: The border for this picture is merely a negative made by photographing a small wooden picture frame. Right: When used for contact printing, the paper mask is simply placed over the negative.

A concave chisel can be used for cutting masks having round-cornered openings.

in cutting with the corner of a *sharp* razor blade. The round corners are made with a concave wood chisel; a sharp tap with a mallet is all that is necessary.

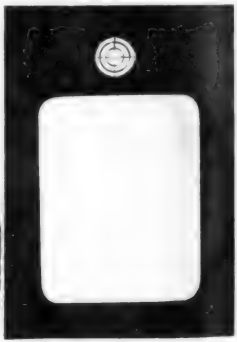
Some masks are made of thick paper, cardboard or colored celluloid, and consequently they prevent absolute contact at the edges. The results are fuzzy. To make an extremely thin mask, cut a paper template, attach it to a sheet of thin glass with rubber cement, then coat or spray the border of the glass with thin black or red varnish. When this is dry the paper template can be pulled away to leave a sharply-outlined opening that will not prevent the edges of your pictures from being sharp. Use the masking glass underneath the negative.

When you enlarge your negatives, the mask shown in the lower right corner of this page is excellent to use. It has a small cellophane-covered window marked with black India-ink lines which are easily focused sharply on the easel. You will appreciate it particularly when working with dense negatives!

A number of decorative effects which replace the ordinary white borders, for snapshots or anything larger, can be seen in the illustrations. In most cases the borders are printed in from another negative. The latter are made by photographing unusual textures, such as corrugated cardboard, coarse cloth, the buckram binding of a large book and similar materials. You can also make a negative of a wood picture frame or portrait mount.

[*Continued on page* 121]

Below: Air-brushing a mask on a sheet of glass. Such masks are very thin and prints made with them will have sharp edges. Right: An additional cellophane window, with inked cross lines, makes it easy to focus sharply when enlarging. This mask is used next to the negative.



Copying With the Enlarger

by Richard Burnett

MANY amateur photographers at one time or another have occasion to make a copy of some photograph or article of which the negative has been lost. Perhaps some friend has a picture that he wants copied and would gladly pay to have you do the work for him.

Copy work cannot be done with most hand cameras, but you can make a temporary copying camera out of the average enlarger. The cost is practically nothing and you can turn out very satisfactory copies of almost anything you might come in contact with.

I use a standard 5x7-inch enlarger, as shown in the illustration, using the lens from my camera. Naturally a few changes have to be made in the enlarger in order to convert it into a copy camera.

The first step is to remove the lamp house from the enlarger. (Top photo). Then take out the ground glass or opal glass which is used in the enlarger for diffusing the light. You must also remove the negative carrier. Now you are ready to proceed.

Take out the glass which holds the film in the negative carrier and substitute for it a piece of ground glass, which can be purchased for a nominal sum. If you wish to make your own ground glass you can do so easily by grinding the glass with ordinary valve grinding compound, which can be bought in any automobile supply store. Just put some of the compound on the glass and, using another piece of glass, rub vigorously. Wash the glass with water. If it is not dense enough repeat the process. Place the ground glass in the negative carrier and put the carrier back in the enlarger.

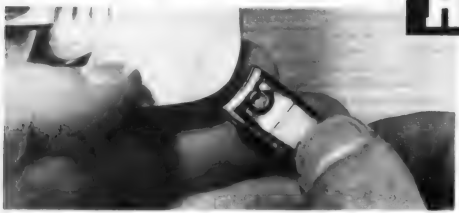
You are now ready to focus. Place the picture to be copied on your easel and proceed to focus, as shown in the lower illustration. Focusing is done the same as it is with any camera with a ground glass back, by using the rack and pinion on the side of the enlarger. To get the right size you raise or lower the enlarger until the image fills the ground glass. The enlarger is locked to the correct focus and again the negative carrier is taken out. The lamp house is now replaced, to prevent stray light from striking the negative carrier.

For lighting I use four 75-watt lights in reflectors, which are placed two on each side of the object to be copied. For most work

[*Continued on page* 121]

HINTS

Clippers Round Print Corners



A NAIL clipper may be used to considerable advantage in photographic work, particularly in rounding the corners of negatives and prints. Clipping the sharp corners of negatives eliminates the possibility of scratching the emulsion when films are stored in a box.

Sharp Shadows With Photoflood Lamps

AN EXCELLENT way to obtain raw, undiffused light for special effects is to make a "window" on photoflood lamps that have outside frosting. Such a lamp can be made to cast a clear shadow by spreading a thin film of glycerine or sodium silicate over the lower part of the bulb. Either liquid temporarily hides the frosting. It is easily wiped off later.

"C" Clamp Holds Floodlight Lamps

A 10-CENT "C" clamp substituted for the regular spring clamp on portable floodlights serves as an excellent grip. Soft rubber washer between jaws of clamp prevent damage to chairs and woodwork. Some clamps require filing a notch in center.

Negative Pencils

THE so-called "negative" pencil is a grease pencil available from art supply stores and is useful for writing on smooth surfaces, bottles, prints and labels. It shows up very clearly on surfaces that will not "take" markings from ordinary lead.

Lens Filter Strap Attaches To Wrist

RIVET several wood discs to a leather strap that fits about the wrist. Lens filters may be slipped on these discs to facilitate their handling.

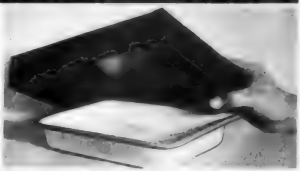
FOR CAMERA FANS

Keeping Negatives Cool

A GOOD way to protect negatives by dissipating heat generated by the lamp housing is to cut a negative mask of sheet copper long enough to project several inches from each side of the enlarger. It should be painted a dead black.

Increasing Angle Of Spotlight

BY ADDING a bent steel or brass rod between the lamp and upper part of a reflector stand, it is possible to increase the angle at which a spotlight or reflector may be tilted.

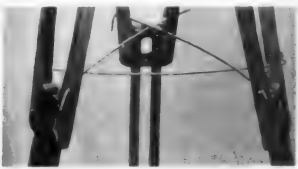


Cover For Developing Tray

A COVER made of cardboard or sheet metal, painted a flat black and which may be slipped over a developing or fixing tray, serves as an excellent safeguard against fogging.

Iodine Removes Black Spots

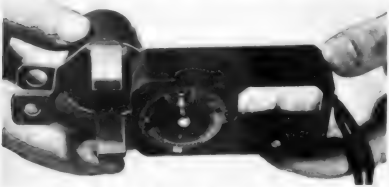
ORDINARY tincture of iodine will remove black spots from prints that are due to pin holes. Apply the chemical with a swab of cotton on the end of a tooth pick. Then refix the print in plain hypo. The spot may now appear too white but a little spotting with a soft pencil will correct it.

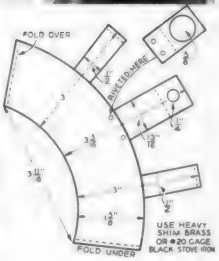


Wire Tripod Brace

THREE strips of stiff wire cut from clothes hangers serve as excellent tripod braces. Drill facing holes in the tripod legs, push the wires through and bend one end. The wires will hold in place through their own springiness.

Above: Front view of the sight attached to a Weston exposure meter. Above, right: The meter is held in the usual manner, but the sight confines the size of the area from which the reading is taken.





Above: The device slides over the left end of the meter case. Right: Template for the sight. Brass or aluminum is suitable.

SIGHT FOR ELECTRIC PHOTOMETER

THE correct and accurate way to use an electric exposure meter is to measure the light reflected from only the subject and not that from the background, foreground or sky. Light reflected from the sky is particularly troublesome as it is liable to cause a high meter reading.

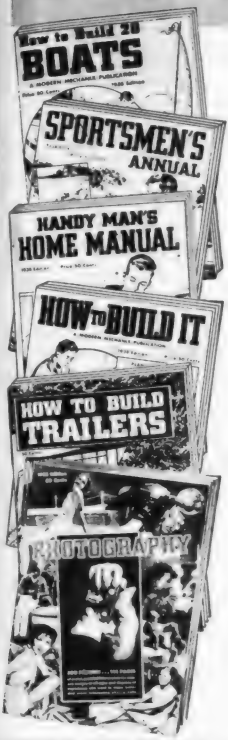
Often enough it is not possible to make a close meter reading of a distant or inaccessible subject, but accuracy can be secured with the use of the simple meter sight illustrated here. The particular model was designed for the standard Weston meter, but one can be made, with slight alterations, to fit a meter of any type.

The device can be slipped on or off the meter in an instant. It confines the view of the photometer cell to a definite area which is identical with that seen through two sighting holes. Readings of subjects near the horizon can be taken without fear that light from the sky will upset calculations. Likewise, readings of well-lighted subjects will not be disturbed by a darker foreground.

The meter is held in the usual manner and about 5 inches from the eyes. Locate the subject in the sight, then note the reading. The light opening of the device reduces the field and amount of light reaching the cell exactly half, therefore all readings are to be doubled to arrive at the correct exposure.

It is important that the inside of the cone be painted a dead black. Line up the sights by pointing the device at a definite object, note how much area can be seen through the cone opening and adjust the sights to take in the same view. Face the meter to the sky and take readings with and without the device in place. The latter reading should be just twice as great as the former.

BARGAINS IN BOOKS
AND BLUEPRINTS



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PRINTS STICK TO FERRO-PLATES

My prints stick to ferrotyping plates so that they tear when I remove them. Why is this?—Parker Smilie, Montgomery, Ala.

Prints usually stick to ferrotyping plates because the plates are not clean or because the prints have not been sufficiently washed in running water after processing. To correct this difficulty, use a full-strength hypo for fixing and wash prints at least 30 minutes in running water. Stir the prints occasionally during washing. Clean the ferrotyping plates with soap and water before using and repeat this washing of the plates after each set of prints have been ferrotyped and before the next ones are put on. It is also advisable to dip the plates in very hot water just before the prints are applied. Take care that no abrasives are in the soap when washing the plates, or the plates may become scratched.

NEGATIVE REDUCTION

I over-developed several negatives. What can I do to correct them?—F. A. Honkanen, Ironwood, Mich.

Over-developed or over-exposed negatives may be corrected by the "reduction" process. In the case of over-exposures, the negative gives flat and foggy without contrast because of existence of too much silver metal. In the case of over-development, the negative will appear too contrasty. To adjust these negatives for satisfactory printing, some of the silver image must be removed without injuring the negative. Probably the type reducer most desirable for over-developed negatives is the super-proportional or flattening reducer. This type acts first on the denser parts of the silver image, especially where the highlights are too opaque for printing. Ammonium Persulphate is the only chemical known which has the peculiar property of attacking the denser parts of the silver image without destroying the shadow details to any extent. This chemical is prepared by adding 2 to 3 drops of chemically pure sulphuric acid to every 3½ ounces of a 2 per cent solution of Ammonium Persulphate. Be sure the negative is well fixed and then immerse it in this solution. Observe the action carefully as it easily goes too far, attacking the shadows as well as the highlights. Remove the negative quickly when the grade of density seems satisfactory and place it immediately in a 5 per cent solution of sodium sulphite to stop reduction action. Then wash as usual.

SATURATED BROMIDE SOLUTION

What method assures a correct saturated solution of potassium bromide?—P. H. Dantz, Denver, Colo.

A great possibility of error can occur in formulas that call for a saturated stock solution of potassium bromide, because the quantity used depends entirely upon the weather. More can be dissolved at high temperatures than at low temperatures. This means that the strength of the solution changes with the weather because more and more potassium bromide will precipitate out as the weather gets cooler. This source of error may be eliminated by preparing a 10 per cent stock solution by taking one ounce of potassium bromide and dissolving it in enough water to make 10 ounces in all. A 10 per cent solution does not contain enough potassium bromide to have it affected by changes in temperature, so that its strength is always the same. The following proportions should be used: 10 drops equal 1 grain of potassium bromide.

GLAZING PRINTS ON GLASS

What is the method for glazing prints on glass?—C. H. Clifford, Darien, Conn.

Prints with a gelatin surface may be squeegeed on glass for a glass finish. The glass should be free from blemishes and cleaned in hot water with the addition of a little washing soda. After rinsing in clear water, polish with a duster and a mixture of a 10 per cent solution of ammonia and methylated spirit in equal parts. When thoroughly clean and dry, dust a little French chalk over the surface and then wipe off lightly. There are other preparations which may also be used, and anything of a slightly greasy nature that will prevent the prints from sticking to the glass, is usually satisfactory. A coating of paste wax (unadulterated with quick-drying qualities) may also be used when applied in a thin coat and spread evenly. Polishing the glass with a soft cloth saturated in paraffin will also do the trick.

PRINTING ON SILK

What is the process for printing on silk?—C. Becker, Brooklyn, N. Y.

Several photographic processes are applicable to silk and other textiles. Generally a coat of gelatin used as a sizing agent is often applied first. The following coating may be applied to silk, linen, muslin or canvas: 10 ounces of water, 100 grains of common salt and 20 grains of gelatin. Dissolve this mixture under heat and uniformly moisten the textile with it. Be sure to stretch the textile on a frame. When textile is dry, moisten it again with a solution of silver nitrate, 40 grains to the ounce. The material being once more dried, is ready for printing.

DEPTH OF FOCUS

What is meant by depth of focus?—David Carpenter, Bridgewater, Ark.

Depth of focus refers to that part of a picture which is sharp and includes the field bounded by the point in the foreground nearest to the lens that is sharp and by the point farthest from the lens that is also sharp. These two extreme points of sharpness indicate the depth of focus which increases as the diaphragm is made small and decreases as the lens diaphragm is made large.

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The editors of MECHANIX ILLUSTRATED distribute $40 in cash awards each month to the five persons who, in their opinion, submit the best pictures suitable for publication in the MECHANIX ILLUSTRATED Photography section. Full particulars regarding these awards will be found in this issue on page 107.

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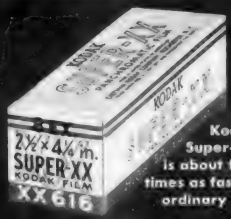

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Thrills And Spills With Racers

[*Continued from page 40*]

Bob Meyers is another driver who uses springs and no axle on the front-end so that the wheels pitch, but his engine is an outboard that costs $225. Cost is an important element in equipping midget racers. A J.A.P. costs over $600 and is considered by many as the ideal motor because of its performance and the fact that it will hold up. When in good condition, this motor is good for 15 races whereas an outboard has to be torn down and rebuilt every three to five races.

The V8 is considered by some drivers as "too much iron" but there's a V8 in practically every race. It can be geared to do over 100 miles an hour and rebuilt for half the cost of other engines. There's no end to the midget racer's imagination when it comes to converting an engine—any engine—for his kiddy-car. Harold Bjanes took a Continental engine designed for industrial use in tractors and commercial power plants and made a racing engine of it by changing the gear ratio, increasing the compression and raising the horsepower from 35 to 45 at 5500 rpm.

The question of when is a midget not a midget is answered by the general specifications adhered to by all midget racing groups. Weight limits are between 500 and 950 pounds. Wheelbases are between 70 and 76 inches, tread is 42 to 46 inches and height is 36 inches from ground to top of cowling. Superchargers may be used on 2-cycle engines of 50 cu. in. displacement. Non-supercharged motors generally have a displacement of 61½ cu. in. and not over 85 cu. in. and are equipped with two or more carburetors.

Average car weight is 750 to 850 pounds (if they get too light they bounce around) and in order to keep them at that weight, the drivers have to do some weird things. It's hard to keep the weight down in 2-cycle, 4-cylinder engines. Most of the time the driver needs every ounce of power and they drive with the throttle down to the floor. "We open up everything but the doors," say the drivers, "and we would open those too, if we had any!" Drivers who purchase the high-powered Offenhausers usually figure on pruning down weight to even things up.

Pete Naccarato, whose driverless car won a race for him, substituted the rear-end from an old model-T Ford with a lighter driveshaft housing to eliminate weight. He also took out the radius rods and put in others of dural airplane tubing. An aluminum clutch replaced the iron one and more weight came off. Finally he tore down the spring assembly and rebuilt it as a cross-spring assembly with one in front and one in the rear. He added tail guards to keep other racers from climbing aboard and wheel guards as safety arms in front of the rear wheels to keep from locking arms with another racer.

Reducing weight, however, can be carried too far, as Pete found out. One of his earlier light racers struck a dip in the track and before the

[*Continued on page 120*]

Combination Rack And Tray

[*Continued from page 98*]

up the top of the second mound, set it over the end of a ⅝" round iron bar and hammer the top of the mound down flat.

The pipe holder is cut from the same material. It is hammered and the sides are rolled up while the piece is straight. Then place the piece on a lead block, and placing the ball of one hammer where the bend is to be made, drive it down with a second hammer. Drill a hole in the center of the bend in the rack, and one in the center of the mound, and rivet the pipe holder in place.

To finish, coat the piece evenly with copper nitrate solution and heat with a blow torch until it turns green, then brown. Dust off, and if it is not dark enough, repeat the operation. Burnish the highlights with fine emery paper and wax with ordinary floor wax, and polish. The finish is very durable and is not affected by heat from a pipe or by hot ashes.

After the piece is all finished, drill a hole in the center of the other mound, set a cork on the mound and fasten from the under side with a round head wood screw. Paint the sides of the cork with black lacquer.

The pipe rack will always keep the pipe right side up and prevent the spilling of ashes, and the cork becomes a good place to knock the ashes from the pipe.

New Uses For Old Shoes

[*Continued from page 86*]

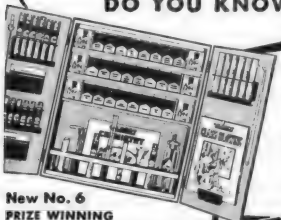
fine a thong as possible. Figure 7 illustrates the routine of lacing.

Two types of lanyards are shown in Figs. 5 and 6. One is square, and one is diamond-plaited round, the latter being smaller and more flexible. This type of plaiting can be used for making watch fobs, hatbands, bridles and whips.

A simple project for the beginner is a coin or stamp purse as shown in Fig. 8. Cut as large a rectangular piece as possible, or, if a large enough piece cannot be cut, then make the purse with two pieces, or even three, lacing them together along the edge of the purse. Cut two slots in one end and cut a tongue on the other, to serve as a fastening for the purse. If you prefer, snap fasteners may be put on instead of the tongue and slots. Snap fasteners and the simple tools for attaching them may be purchased at leather goods stores or through dealers in handicraft materials. Punch the edges with an awl for lacing. Tool a monogram or design on the back. It will facilitate the lacing if you will first fasten together the edges to be laced, using rubber cement. Open each hole with an awl as you go. Be careful not to draw the thong too tight, because it would cause the edges to curl.

The craters on the moon are mountains in ring form, 50 to 60 miles in diameter.

Boys! HOW MANY OF THESE CHEMICAL SECRETS DO YOU KNOW?



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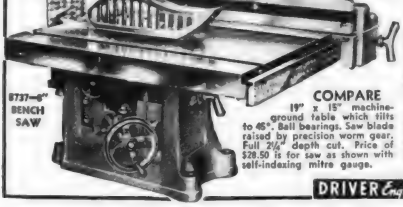

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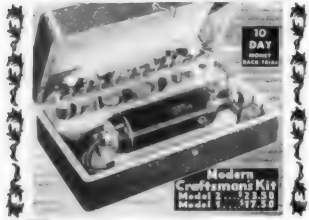

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Build The MI "Sky Flea"

[*Continued from page* 89]

given to the wing by cementing the two halves together while holding the one half flat and raising the other until its tip is two inches above the table (see sketch). Allow this union of wing halves to dry thoroughly before completing the model. Cement a small section of two thicknesses of wrapping paper to the trailing edge of the wing at the center to provide the necessary angle of incidence when the wing is attached to the motor stick.

The tail surfaces—rudders and stabilizer—are slotted so that they can be interlocked, providing a fairly rigid support for the rudders. Cement the rudders and stabilizer together at the points where the slots make contact. The wing and the tail unit are held to the motor stick by means of looped rubber bands, making contact with the underside of the stick.

Before winding up the rubber strand motor, test your model by hand-launching it, permitting it to glide through the air. If it has a tendency to climb and stall, move the wing backward. If it dives, move the wing forward. Having made the necessary adjustments, wind the rubber strands until the second row of knots appears and launch it.

Thrills And Spills With Racers

[*Continued from page* 118]

driver knew it he was sailing through the air, slipping out of his safety belt and landing wrong side up on the track. That was one time a crash helmet served him a good turn. Crash helmets are now a rule of the tracks. Harry Lewis is living today because he was wearing a helmet when he was thrown from his racer and landed on his head. The helmet was split open and Lewis was stunned but at least his head remained whole.

The spectators who turn out to see some thrills, and that means spills, like to see the midgets flip over. That makes it tough on the drivers, but it's all part of the game. As a matter of fact, the good driver can take a flip by ducking from side to side as the car rolls over. There's no room inside of the midget for the driver to crouch so the sides of the body are cut low, permitting the driver to lean over far.

When the races start the cars seem to bounce and bump about like a school of scatter-brained ants. The racers swing quickly into a dangerous snarl and crawl around the track with engines spitting and stalling, roaring and smoking. The cars scrape wheels and nudge one another as drivers jocky for position. Sometimes one driver will hold back half a lap and the boys in-the-know say that it is a purposeful maneuver designed to load up the outboards which can't stand the slow pace because their carburetors become

[*Continued on page* 128]

Copying With Enlarger

[*Continued from page* 111]

the lights should be placed at an angle of 45 degrees or until the object is free from reflections. You will have to experiment at first for the exposure. For copying pictures the exposure usually runs between 12 and 20 seconds, depending on how dark the print to be copied is, and, of course, the distance between the lens and the easel. These exposures are for "commercial" cut film. If I have to copy colored prints I use panchromatic, which is three times faster. Of course, pan film must be handled in complete darkness; orthochromatic film can be used under a red safelight.

Next take the ground glass out of the negative carrier and replace the original glass, inserting a piece of film in the carrier, emulsion side down. Place several thicknesses of black paper over the film so that no fogging occurs. Now place the carrier back in the enlarger. As the film is in the exact location that the ground glass was, it will be in perfect focus. Stop down to f.16 and make your exposure. If you have a lens cap you can turn on your lights and make the exposure by taking the lens cap off and replacing it when the exposure is over.

If you find that the film is getting light struck you will have to shield the negative carrier from the lights. I use two pieces of cardboard which I wedge between the carrier and the enlarger. This has worked very satisfactorily.

Dress Up Your Prints

[*Continued from page* 110]

With the double-printing method, cut a sheet of masking paper to the size of your printing paper. Next make a cardboard template or guide to the size of the picture desired. Center it on the mask and cut around with a razor blade. The outside part is used to protect the printing paper while the picture negative is being exposed. The inside portion may be attached to a sheet of glass, of the same size as the printing paper, to protect the picture opening while printing the border from another negative.

Single printing can be done by using the border negative as a mask, cutting away the opening for the picture. The edge of the opening must be blocked out for about ⅛-inch to conceal the edges of the picture negative.

Build "Ice-Sprite"

[*Continued from page* 92]

to a machine shop where it can be done expertly and economically. The 45-degree bevelled cutting edges should be filed and honed to produce fast blades.

Make the front hobblers of angle iron as shown

[*Continued on page* 127]

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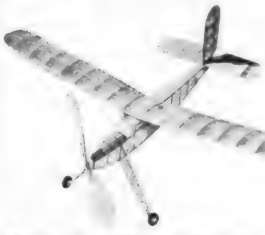
"Men With Wings" Contest

[Continued from page 80]



A kit of parts for constructing this rubber-powered Air-King endurance model will be awarded as 16th prize.

Eighth, ninth and tenth prizes are complete kits (less engines) for constructing "Maxwell Bassett," "Flying Quaker" and "Quaker Flash" gas-powered model airplanes, respectively. These three kits were donated by Megow's of Philadelphia, Pa.

The eleventh and twelfth prizes consist of complete kits of machined parts for assembling G.H.Q. miniature gasoline engines, which were donated by G. H. Q. Motors, Inc., of New York, N. Y.

Thirteenth prize is a complete kit of parts (less engine) for constructing a Bay Ridge "Mike" gas-powered model airplane donated by the Bay Ridge Model Airplane & Supply Co., of Brooklyn, N. Y.

Fourteenth prize consists of a Brown, Jr., Model D miniature gasoline engine, completely assembled and including a streamlined exhaust manifold, a Polk's Perfect-Pitch propeller with a solid aluminum spinner. This motor, with accessories, was donated by Polk's Hobbies Shop of New York, N. Y.

Fifteenth prize is a construction kit for building a Silver Streak rubber-powered model airplane, donated by the Country Club Aero Supply Co., of Kansas City, Mo.

Sixteenth prize is a kit of parts for constructing a rubber-powered Cabin Endurance model plane, donated by the Air-King Model Co., of Portland, Oregon.

Seventeenth prize is a kit of parts for building a 50-inch rubber-powered cabin endurance model airplane, which was donated by Paul K. Guillow, of Wakefield, Mass.

Eighteenth to twenty-third prize, inclusive, consist of copies of "Your Wings," a complete aviation "ground school" course in book form, written by Assen Jordanoff, and published by Funk & Wagnalls Co., of New York, N. Y., who donated the books.

[Continued on page 129]

Submarines In The Future

[*Continued from page 64*]

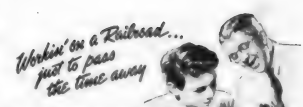
overhead, in a blind boat that cannot see a foot ahead of its nose and must steer by its instruments. The uninformed will think of such a voyage as the ultimate in reckless folly and soggy, chill discomfort. Yet it would be neither dangerous nor uncomfortable. The one very doubtful pleasure the winter voyager would be forced to forego would be his morning constitutional on a deck heaped with ice and swept by furious waves.

In 1898 I appeared before the faculty of the Johns Hopkins University and advocated the building of a submarine for use under the ice. I was ahead of my time, for the submarine had not then been brought to its present efficiency, but my argument holds good today. Nansen had just returned from eighteen months on the arctic ice in an effort to reach the North Pole, and reported that he found no ice more than fourteen feet thick. He had averaged only three-quarters of a mile a day, because he constantly met open stretches of water and vast areas of melted slush. Since then I have talked with many other explorers—Sverdrup, Amundsen, Bartlett, Stefansson, and several Russians—and they agree with Nansen that the ice is not too thick and that it is the difficulties of the surface that make polar travel almost impossible.

Take a submarine built to this order: its top like a toboggan or a ski with a downward inclined bow; the axis inclined a few degrees so that the bottom of the bow is twenty feet or more below the surface; a Sperry Autogyro steering-gear—go ahead on the motors, and you will make progress under the ice. Now and then the boat will bob up gently in an open lead and the batteries can be recharged. If you don't strike open water—what of it? A means for drilling up through the ice and projecting two casings to the open air has been devised. Through one fresh air would be taken in, through the other noxious gases expelled—as simple as that. Tests show that the drilling can be done at the rate of one foot a minute with a three horse-power motor. The recharged batteries would be good for about one hundred miles at a moderate speed.

In 1904 I made an entirely successful run under the ice of Narragansett Bay, taking with me Major Arthur Murray, later chief of Coast Artillery, and Captains E. J. Bailey and C. E Parker. In Russia I made some further experiments and was about to arrange for the construction of an under-ice boat for that government. The Russians planned to ship under the ice from the Baltic to their Pacific coast instead of by the Suez Canal, but the war with Japan ended and the project was dropped. I discussed the idea at a dinner given me by the president and directors of the North German Lloyd in Bremerhaven in 1908, but we were all too busy just then to do anything about it. Yet it was out of this talk that the *Deutschland* evolved. Other things engaged my attention until

[*Continued on page 126*]



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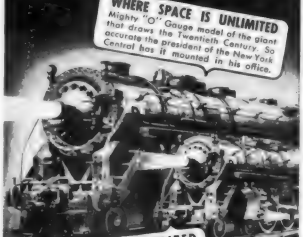

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Minerals Make Mounts

[*Continued from page* 101]

the bottom and seal on a cover. The sand is not attached in any way and will roll around with tilting or shaking, presenting different views of individual elements. Especially recommended for this work are garnet sand, magnetite sand (pass a magnet below this slide while looking through the microscope and see what happens), colite, foraminiferal and radiolarian sands, dune sand, ocean beach sand, glass-making sand and diatomaceous earth.

Clay, loam and volcanic ash may be studied in this fashion, though the next method is better for such fine soils.

Shake up a bit of clay soil in a small bottle of water so as to make a fairly heavy suspension. Before the soil particles settle, pipette one large drop of this mixture onto a slide and set aside in a dust-free place until the water has evaporated and has left a fine and thin film of the clay particles on the slide. Add balsam and cover glass.

It is possible to make thin sections of rocks and minerals but expensive apparatus and considerable training are required. As a substitute, secure some thin flakes or slabs of various specimens by using an ice pick or cold chisel and hammer. Then grind them down on an emery wheel and finish between two hones until exceedingly thin and translucent. Mount in balsam.

Mineral and rock sections may be studied with ordinary transmitted light, like regular biological mounts, but much more is to be gained by the use of *polarized* light, which is difficult either to define or discuss even for those taking a course in physics. We will make the attempt, however.

The wave theory of light assumes that the ether vibrates transversely to the direction in which the ray of light is traveling, but that these vibrations vary through all possible transverse planes so rapidly as to show no particular direction of their own. If they can be given a definite direction, the ray of light is said to be polarized, and the instrument performing this function is a polariscope. When magnification is also introduced, we have a polarizing microscope.

Formerly the principal means of effecting polarization was by the use of two Nicol prisms, each of which is made by cutting a clear calcite prism along a diagonal axis, then polishing the cut surfaces and cementing them together again with balsam. A beam of ordinary light entering such a prism and striking the diagonal cut is split into two parts, one being refracted out of the picture and the other passed on to illuminate an object placed on the stage of the microscope. Both rays are polarized but only one is transmitted, thus cutting down the amount of light available for use and requiring a correspondingly strong initial light source.

One prism, called the polarizer, is situated beneath the condenser of a standard laboratory

Accept No Substitutes! Always Insist on the Advertised Brand!

microscope. The second is termed the analyzer and is placed like a cap upon the eyepiece. Both may be rotated though the analyzer is the usual one turned because it is more accessible. When the diagonals of the two prisms are parallel, the beam of light passes directly through both and the field of view appears brightly illuminated.

When the analyzer is rotated so that the position of its diagonal is at a right angle to that of the polarizer, the nicols are said to be crossed, and none of the beam light is transmitted.

The field appears black, but if optically active (doubly refractive) objects are placed on the stage, they will again polarize the light coming through the polarizer so that some of it can pass the analyzer. They glow, as if self-luminous, in a dark field. They are not only beautiful objects for observation, but yield much important information to research scientists. The amount of rotation necessary to produce certain effects can be measured, and the effects themselves indicate definite physical construction of all sorts of matter.

Today the polarizing microscope detects strain in glass, flaws in metals, adulterants in foods and textiles and in thousands of other ways adds to our knowledge of the makeup of the physical universe in which we live.

Recently there has come on the market an inexpensive form of coated plate known as a polaroid which will produce the polarizing effect and has the additional advantage of permitting cutting into strips or pieces of any desired size. A pair of polaroids can be secured at low cost to fit any type of microscope, including miniature models, and since they work best with the lower powers of magnification, have placed polarized light within the reach of everyone. (See September, 1938 issue of MECHANIX ILLUSTRATED "How To Polarize Your Microscope.")

As an example of an experiment to try with these plates, make a strong solution of salt (sodium chloride) in water, put a large drop on an absolutely clean slide, and allow to dry thoroughly, then add balsam and a cover. The salt crystalizes out as the water evaporates. You can watch this happen under the microscope, and the cubes thus formed are interesting to observe by ordinary transmitted light. When polarized, no change will be observed—salt is optically inactive.

Now repeat the same procedure, this time using potassium ferricyanide, and note the array of colors shown under crossed polaroids. This salt is optically active. If you want to see gorgeous color and form under a lens, make up a saturated solution of tartaric acid and prepare a slide by the evaporation method. Not every slide so made will be perfect, but good ones should show beautiful leaf-like crystals in brilliant blues, shading off into mauves and yellows. Other subjects for polarized light include borax, aspirin, acetanilid,

[*Continued on page 129*]

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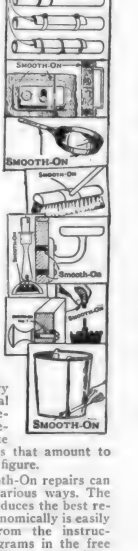

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Submarine In The Future

[*Continued from page* 123]

the Lake Company was closed down. One day I read an interview with Sir Hubert Wilkins, who had just made his first flight across the Arctic:

"There were no suitable landing places," he said. "I think the Pole could most easily be reached by submarine."

I met him along with Captain Sloan Danenhower, who had at one time been in command of submarines in the United States Navy, and later had represented the Navy in charge of our builders' trials at Bridgeport during the testing of new submarines. The Lake-Danenhower Company was formed, the plan being to use the old *Defender*, built in 1907, but later we were able to borrow the O-12 from the Navy. It was a much larger and more powerful vessel and was one of those scheduled for destruction under the Balfour agreement. We agreed to pay one dollar a year and, when we were through with her, return her to the Navy for destruction.

I designed a new superstructure and put in a diving compartment which later enabled scientists to collect specimens of arctic marine life through an opened door. On its first expedition, the submarine proved the practicability of traveling through and under heavy ice. It seems that much valuable data was accumulated in determining the contour of the arctic water bed, and I understand that Dr. Sverdrup, one of the scientists on the expedition who spent many hours in the diving compartment, is preparing a book describing this work. One of these days some one, government, transportation company, or well-to-do individual, will build the right kind of a submarine for under-ice and commercial work, and overnight it will be accepted as other mechanical advances of the day have been. Such a submarine should be more rugged than the military type, and the propelling machinery should be designed for giving a powerful thrust at a slow speed rather than for fast going. The expensive installations required for armament and for quick submergence could be dispensed with and the cost reduced to about one-fourth of a military craft.

When one considers that about three-quarters of the earth's surface is covered with water and that there are treasures known to be awaiting us in the depths, it seems certain that eventually commercial-type submarines will be found in every sea. It has recently been reported that the radium content of the red clay found a certain place on the sea bottom is far greater than in the richest ore as yet discovered. Gold can be washed out on the sea bottom, the cargoes of sunken ships can be recovered, pearls found, sponges taken, and perhaps—who knows?—that old road that leads down into the sea may be traced direct to the Lost Continent.

I'd like to make that trip over the bottom that Dr. Beebe talks about and, perhaps, drift the boat through the streets of Atlantis and peer in through the windows of the drowned palaces. Who knows?

Build "Ice-Sprite"

[*Continued from page* 121]

and bolt them to the front runnerplank so that the runners, when attached, are exactly 84 inches apart—center to center. The front runnerplank can be attached to the hull at this time. Before tightening the bolts square the runners with the runnerplank and align them precisely fore and aft to avoid all possibility of drag.

The duplicate rudder posts and the steering assembly are made to the plans given. The actual details of the tiller post and steering post assembly may be varied to suit materials available but in any case the most careful alignment of the two 8-inch grooved wheels is imperative. Bolt the steering post and pulley to the rear runnerplank exactly in the center with the pulley extending below the hull to leave clearance for the connecting cable. The tiller post is then bolted down to the cross member in the cockpit with the pulley aligned with the steering post pulley.

The rudder posts are anchored to the runnerplank ends in the manner shown and exactly 84 inches apart, center to center. The rear runners are attached in the same way as the front ones with ½-inch steel king bolts. All runners should hobble freely without side play.

Next bolt the rear runnerplank to the hull and connect the steering cables and rods, squaring the plank to the hull and making sure the runners are absolutely parallel by adjusting the rods. Use an 8-foot batten to determine the equidistance of the fore and aft ends of the runners. Adjustments are made with a turnbuckle on the cable and with screweleyes on the rods. The cable connecting the pulleys may be hooked up as shown or crossed. By crossing the cable the tiller action will be positive as in steering a car.

The oak mast step has a hole drilled to take the ½-inch bolt with head sawed off which is inserted in the mast foot as a pivot (see page 93). Screw the step in place on the deck so that the mast foot is centered exactly 27 inches from the bow end of the hull.

Mast and spar details are covered in the drawings. Note that the mast is made in two halves —each piece grooved and slotted to form a sail and bolt-rope track when glued together. The boom is made similarly.

The forestays can be of $\frac{3}{16}$-inch airplane cable or of $\frac{1}{4}$-inch rod to suit. They are attached as shown. The unique bow-shaped wooden guys which form the after stays are made up of 6 laminations of 1/4x3-inch basswood strips held together with casein glue. These bow-shaped stays allow the boom to be let out freely in a high wind without danger to novices.

The foot end of each of these stays is anchored to an angle iron plate which also serves as the anchor plate for the rudder post. This detail is clearly shown in the drawings on page 93. The

[*Continued on page* 128]

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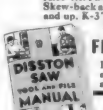

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Thrills And Spills With Racers

[*Continued from page 120*]

flooded. When they get the yellow flag designating a clear track the midgets leap forward with a roar as though shot from a cannon.

Drivers like Garson, Peterson, Gesel and Schneider eat fairly well. They may earn $1,500 to $2,000 in a two-month racing season. Most of them don't own the cars and have to split their winnings with the owners who get 60 per cent and all the repair bills and headaches while the drivers get the bumps and 40 per cent. Still, it pays—if you're a consistent winner. In two months at the Roosevelt raceway, Joe Garson made $1,725; Peterson earned $1,700; Ted Hartley earned 1,263 and Harry Sheeler made $1,182.

But what about the drivers who never win; who earn $150 to $250 and never see the inside of the pay-off? Individual tracks have their own particular means for keeping drivers on tap. They realize that everyone can't win, so they scatter the winnings and, as at the Roosevelt track, every man who enters a race gets at least $3, even though he never finishes. Roosevelt track has paid out $23,000 in 22 races. An evening's racing consists of 9 heats of which the first four pay $56 among 8 men. The fifth and sixth pay $135 each, divided among 10 men. The seventh pays $68 and the eighth pays $90. The feature pays $248 among 14 starters. Tops is $58, next is $41 and the rest of the money is graded so that the last of the 14 starters receives $3. If a driver wins all his heats, he can gross $140 for the evening—but few ever do.

The $3-men, starters who never get going, are able to stay in the game chiefly because garage is free and track officials provide them with free cots and blankets. The consolation money is enough to provide them with food.

Danger rides at the wheel in every race and the driver who runs afoul of "Misfortune" has the choice of crashing into the guard rail or heading into one of the many bales of hay scattered about the infield to soften the fall. But sometimes the driver has no choice and he crashes suddenly and hard. The knowledge that a spectacular spill may occur at any moment, with four or five cars piling up, packs the spectators in. So for the present, at least, it's a great day for the midgets!

Build "Ice-Sprite"

[*Continued from page 127*]

mast, when properly rigged is raked aft 48 inches.

As this ice boat is fast and suitable for racing the sail should be made with pockets sewn in for full-length battens (slats) to control the flow of sail as is necessary for racing. In ordering the sail from your sailmaker specify an additional bolt-rope for hoisting.

Runners and other metal parts can be finished with aluminum paint. The seat, back-rest and cushions are left to the builder's discretion.

"Men With Wings" Contest

[*Continued from page 122*]

CONTEST RULES

Anyone except employees of Paramount Pictures and Fawcett Publications can enter the contest. The prizes will be awarded to the 23 persons who, in the opinion of the judges, send in the most nearly correct answers to the ten aviation questions listed in the box on page 79 and the best 25-to-50-word letters on the subject —"Who Is Aviation's Greatest Hero?"

Editors of this magazine are the judges in this contest and their decisions will be final. No entries will be returned. Contestants have until midnight of December 27, 1938, to mail in their entries, and the winners will be announced in the March, 1939 issue of MECHANIX ILLUSTRATED. Address entries to: Contest Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

Minerals Make Mounts

[*Continued from page 125*]

copper sulphate, grape sugar, mica, gypsum, cotton, linen and silk fibers, lens paper, and hairs from persons and animals. Examine first under ordinary and then under polarized light. You will be amazed and delighted at the effects secured.

Carbon Derivative Creates New Industry

A new industry is growing up near Green, West Virginia, around "silica black," a new carbon and silicon-bearing material derivative discovered six years ago by Prof. C. A. Jacobson of West Virginia University.

Produced when coal and a material like diatomaceous earth are mixed and distilled at 600 degree Fahrenheit, "silica black" is an inky-dark powder for which a wide variety of uses is being found, Dr. Jacobson reports.

It is being used as a filler to give paints durability and the ability to resist heat. It is finding application as a supporting medium for finely-powered nickel, used in chemical process whereby hydrogen is added to vegetable oils to make edible fats.

Use as a reinforcing pigment in rubber and plastic molds has also been found. Its high temperature resistance qualities have enabled manufacture of a gasket paste with it that can be used on metal joints which, when heated to nearly 1,000 degress Fahrenheit, will keep the gaskets from burning up. The paste is also useful in applying heater hose in automobiles, on joints in contact with various types of solvents and vapors.

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Shower Unit Is Portable

Designed for use in auto trailers, farms, camps and shops where running water is not available, a portable shower unit has been developed by a manufacturer in Chicago, Ill. The unit is supplied with an overhead tank, which holds enough water for two showers, and a transparent curtain, being attached to the wall by a metal plate fitted with several screws.

Air Conditioned Gold Mine Increases Production

Air conditioning of the Hercules shaft of the East Rand Proprietary Mine, one of the world's greatest sources of gold, has enabled operators to take 50 per cent more gold ore from this shaft at no increase in operating cost, the Central Mining and Investment Corporation of Johannesburg, South Africa, reports.

The only air-conditioned mine in the world, the high rock temperatures in the deeper parts of the mine are reduced by a cooling unit that supplies 150,000 cubic feet of cool air and enables the deep deposits to be worked.

When you complete a how-to-build project, why not send a photo and description of it to the Editor's Workbench department? Perhaps you will be awarded one of the many cash prizes offered by MECHANIX ILLUSTRATED each month. (See page 12).

Airplane With Molded Body Being Readied For Tests

Opening up wide possibilities for rapid manufacture and assembly of airplanes, a plane whose fuselage is made from two pre-molded pieces of plywood bonded by a synthetic plastic is being readied at a Hagerstown, Md., factory for acceptance tests by the Bureau of Air Commerce. The new plane, built by the Clark Aircraft Corporation, already has more than 60 hours in the air to its credit and is reported to be highly promising in performance and the U. S. Army is interested to the point that it has a similar plane, made by the same manufacturer, under trial by the Material Division of the Air Corps at Wright Field, Dayton, Ohio.

Great importance is attached to this and similar developments in view of the quick-manufacture possibilities inherent in plastic materials and to concentrated attention such planes have been receiving abroad.

The plane's fuselage is made of two molded halves which are made of a laminated plywood bonded by a synthetic resin developed in Germany, according to the same source of information. With a gross weight in the neighborhood of 4,500 pounds it is about the same size as the larger private planes, being equipped with a 450 horsepower, 12-cylinder V-type engine.

Planes made of plastic materials have been tried in the United States several times in the past, but they have not made great progress to date. An advantage derived from use of the material is speed in assembling the fuselage. Since airplanes are still largely hand-assembled, this is a factor of importance.

Although it is understood that the material used in this case was not one of those tested by the National Bureau of Standards, laminated plywood of the type used has a high strength to weight ratio, an all-important consideration with aircraft.

New Grade Chemical Makes Translucent Rubber Better

A new grade of magnesium carbonate, used in making translucent rubber products, has been developed by chemists as a step in both improving translucent rubber and lessening American dependence on foreign imports of the substance.

Improvements in translucent rubber products manufactured with it are attributed by its discoverers to the fact that it bends light rays to exactly the same degree as they are bent by translucent rubber. In technical language, the new crystalline substance has the same refractive index as rubber.

Finland is considering the start of a nitrogen industry.

A PIMPLE-FACED OUTCAST AT 17?

Read how to help protect the skin against intestinal poisons

Are you shunned and pitied because of repulsive-looking hickies? Then why not get right at a common cause of this trouble—and take steps *now* to help overcome it?

Between the ages of 13 and 25, final growth takes place. This is often accompanied by disturbances throughout the body. The skin may become over-sensitive. Waste poisons from the intestines often get into the blood, then ugly pimples may break out.

Many young people help solve this problem—simply by eating Fleischmann's Yeast. Each cake of this famous *fresh food* helps eliminate intestinal waste poisons from your body *before* they can get into the blood stream . . . and so gives these pimples a chance to clear up.

Don't run the risk of permanent scars by neglecting such pimples. Start eating Fleischmann's Yeast now . . . 3 cakes daily—one cake ½ hour before meals. Begin now!

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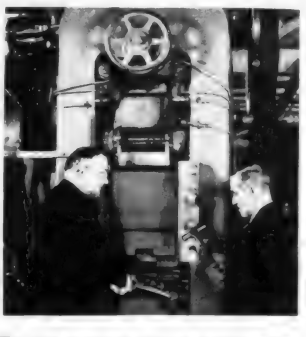

IN THE photograph above, R. D. Reilly, superintendent of the Oldsmobile axle division, is shown explaining the working of a powerful parts press to Charles H. Blades, 78 (right), who holds the blacksmith's hammer with which he hammered out auto parts 41 years ago. The huge press exerts a pressure of 400 tons and is used to compress knee-action parts to proper size.

Photographic Projection Lets Baker "See" Inside Of Bread

The baker can now look inside a slice of bread to check the bread's uniformity, openness and other characteristics playing a large part in determining its quality.

A photographic projection means, by which light is transmitted directly through the slice of bread, focused and directed on photographic paper, was described by William H. Cathcart, of the American Institute of Baking, recently, before the American Association of Cereal Chemists.

No negative is required, a direct print being made, Mr. Cathcart explained. The process is said to be cheap and simple to operate.

When you complete a how-to-build project, why not send a photo and description of it to the Editor's Workbench department? Perhaps you will be awarded one of the many cash prizes offered by MECHANIX ILLUSTRATED each month. (See page 12).

Accept No Substitutes! Always Insist on the Advertised Brand!

Amateur "Sky Sleuths" Hold 27th Annual Convention

America's amateur "sky-sleuths," known as the American Association of Variable Star Observers, held their 27th annual meeting at the Ladd Observatory of Brown University in Providence, R. I., recently.

Since its founding in 1911, the association has piled up a total of more than 600,000 observations. Its present 350 members are now adding to this amount to the extent of some 50,000 observations a year. One member alone, Eugene H. Jones of Goffstown, N. H., has been making about 4,000 observations annually, according to Prof. Charles H. Smiley of Ladd Observatory.

The amateur astronomers, many of whom work with small telescopes they have constructed with their own hands, are gathering astronomical data which are invaluable to professional astronomers. The wide distribution of the membership—in 30 states and 17 foreign countries—assures a fairly continuous record of the ups and downs in the brightness of interesting or unusual variable stars. Clouds may obscure the heavens in one section of the land but there is a good chance that elsewhere, with a clear view, another observer will be able to make crucial observations.

While originally organized to study the brightness of variable stars, the association has now expanded its work and now sponsors five other lines of astronomical research; the search for bright novae (exploding stars), the observation of asteroids (tiny minor planets), the observation of red stars with red filters, lunar occultations and their reduction, and photographic photometry of variable stars.

Rare Earth Elements Found In Hickory Tree Leaves

Chemical elements so rare that they are merely names in a list even to most chemists have been found in the leaves of a hickory tree growing on a mineral vein in a Virginia mine. Analysis by the delicate spectrographic method has betrayed their presence in at least trace quantities, it is announced in a recent issue of the journal, Science, by Drs. W. O. Robinson and Richard Whetstone of the Bureau of Chemistry and Soils, and Dr. Bourdon F. Scribner of the National Bureau of Standards.

The elements all belong to the group known as the rare earths. They are listed as follows: cerium, lanthanum, praseodymium, neodymium, yttrium, samarium, europium, gadolinium, dysprosium, erbium, ytterbium.

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Water Declared Important Part Of Molten Rocks

Water is an important component of molten rocks, even though at high temperatures it is a gas, reports Dr. George W. Morey, geophysicist of the Carnegie Institution of Washington, describing his researches into rock chemistry before the New York Section of the American Chemical Society.

"Liquids dissolve gases," says Dr. Morey, "but when dissolved the gas is no longer a gas but one component of the liquid." He likens the dissolved water (a gas at rock temperatures deep in the earth) to the carbon dioxide dissolved in the water in a bottle of soda-pop. Until the pressure is released, the dissolved gas is a part of the liquid.

Deep in the earth, molten rocks, during the various cooling processes which lead to the formation of ore bodies, drop out one component after another, causing the proportion of water in the melt to increase, and to become more important in the later stages of the cooling process. During these closing stages of volcanic activity, when water is chemically very important, hot springs are the means of escape of the excess heated water.

Practical Magnetic Phone Developed By Engineers

A magnetic telephone requiring no battery or other source of outside electric current for its operation has been developed by engineers of the Bell Telephone Laboratories. Depending on voice vibrations to move an armature placed in the field of a permanent magnet for generating the current which carries speech, the same unit may be used as receiver or transmitter.

The instrument recalls early telephone receivers and transmitters which likewise were magnetic and used no outside source of current. They had, however, too low an output to be practical. It is only in recent years that knowledge of highly magnetic materials and structure has enabled practical use of this type of circuit.

Independence of batteries or other outside power source makes the instrument extremely portable and suitable for use in places such as construction camps. A special portable unit weighs less than two pounds. A wall unit contains separate receiver and transmitter.

When you complete a how-to-build project, why not send a photo and description of it to the Editor's Workbench department? Perhaps you will be awarded one of the many cash prizes offered by MECHANIX ILLUSTRATED each month. (See page 12).

Miniature Schoolroom Tests Merit Of Lighting Systems

Providing an effective demonstration tool with which to prove to educators, parent groups and others the need for adequate lighting in schoolrooms, a miniature schoolroom, which is equipped with various types of scale lighting systems, has been developed by a well known electrical products manufacturer. The model room measures 38 inches in width, 30 inches in height and 42 inches in depth. Fully equipped with miniature desks, chairs, blackboards and lighting fixtures, the model weighs about 260 pounds. The control system of the model schoolroom enables the operator to simulate lighting conditions as they exist in many real schoolrooms and switch to the ideal lighting system to which pupils are entitled.

Machine Tests Pavement's Reaction To Sharp Blows

An automobile tire swinging on the end of a set of aluminum rods has been set to work by the U. S. Bureau of Public Roads to test the reaction of pavement to sharp blows and steady forces, an article in *Public Roads*, published by the U. S. Bureau of Public Roads, reveals.

The unique road-testing machine, L. W. Teller and James A. Buchanan write, imitates closely the effects of an automobile standing on a road and the effect of a car or truck hitting the road after striking a bump, thus enabling engineers to check up on the behavior of the road material.

Impact forces are tested by allowing the wheel, which is mounted at the center of percussion of the pendulum, to swing against an upright slab of concrete, so constructed as to approximate road conditions. Accurate instruments record the amount of bending and other pertinent information.

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Radioactive Element Traced Through Body

Potassium, one of the vitally necessary chemical elements, can now be traced in its course through the body by making it radioactive in an atom-smashing machine, or cyclotron. First results of a research project using this technique have been reported by a group of physiologists at the medical school of the University of California.

Rats were used in the experiments. They were given food containing the artificially radioactive potassium, and its presence later detected with suitable physical instruments. The experimenters report that:

"The absorption of potassium from the gastro-intestinal tract is very rapid . . . about 90 per cent being absorbed within half an hour. Some of the absorbed potassium is very quickly rejected, mainly through the kidneys. The major portion is retained and taken up by the muscles and other soft tissues of the body."

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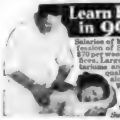

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Small Motor Solves Glider Launching Problem

A powered glider, equipped with a low-power, lightweight engine in the same manner as a sailboat fitted with an auxiliary motor, has been devised by Peter Riedel, German glider enthusiast and winner of last year's U. S. Soaring Contest, as the answer to the sailplane's biggest difficulty—getting off the ground.

A Motor-Condor glider built by Riedel in Germany enabled the noted sailplane enthusiast to get off the ground without the assistance of all the friends he could muster, he reports in the current issue of *Soaring*.

The experimental installation made by Mr. Riedel weighed but 110 pounds, he reveals. Proper design—placing the motor in the fuselage, mounting the propeller on a streamlined mast—need not interfere with the plane's flight despite the added weight, he finds.

Sailplane pilots at present face troublesome difficulties each time they decide to take their ships up for a spin in the air currents. They must either get a pilot to tow them up or have a friend tow them behind a car. If the airport is not well located from the point of view of available rising air currents, they must reach such a point. Then, when the day's soaring is done, the plane comes to rest at a point many miles distant from the starting place. Someone must wait all that time at the starting point to receive a landing report and then dash to the landing place to pick up sailplane and pilot.

A powered glider would solve these difficulties, Mr. Riedel holds. Such a solution is essential to the spread of the sailplane vogue.

For contest purposes, officials might limit the amount of gasoline carried by the plant sufficient to get it to the height up to which tows are now permitted, he points out. Besides that, the plane's barograph would record the vibrations of the motor and in that way it would be known when the motor was shut off.

The experimental plane flown by Mr. Riedel took off in 325 feet and climbed quite satisfactorily. Proper improvements would cut take-off distance to 230 feet.

A three or four-cylinder engine mounted in the fuselage of a plane with a 60-foot wingspan is the proper type of power glider, the glider champion feels. A retractable landing gear is essential for maneuverability around the airport. The power glider is also convenient because it can make its own way back to the airport.

When you complete a how-to-build project, why not send a photo and description of it to the Editor's Workbench department? Perhaps you will be awarded one of the many cash prizes offered by MECHANIX ILLUSTRATED each month. (See page 12).

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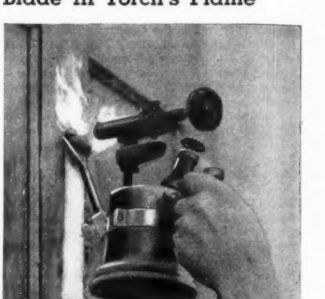

Easily and quickly attached to a gasoline torch, as shown in photo, a newly developed device facilitates the removal of old paint. The device consists of a metal band which fastens around the torch, holding a scraper blade in front of the hot flame. With one stroke the old paint can be scraped off as it burns. Scraper blades of various sizes can be used.

Navy Divers Prove Merit Of New Decompression Method

Surface decompression can replace water-stage decompression for divers at certain depths. This important step forward in protecting divers against the "bends" is the outcome of recent research by the Experimental Diving Unit of the U. S. Navy.

By water-stage decompression is meant the standard slow ascent of a diver with certain stops for definite times on the ascending line. The object of this prescribed schedule is the prevention of compressed air illness, commonly known as the "bends."

For surface decompression the diver is immediately hauled to the surface and his helmet, shoes and belt removed as rapidly as possible. He enters a decompression chamber in the diving vessel and is recompressed to a level corresponding to the first stop under water. Decompression is then conducted as though on the ascending line.

This new method is not intended to replace water-stage decompression but is considered sufficiently safe as an emergency substitute down to a depth of 170 feet for a period of 30 minutes.

Radium Miners Near Arctic Circle Enjoy Home Comforts

Modern science, benefited directly by their activity, is providing miners at Canada's Great Bear Lake radium-bearing pitchblende mine with all the comforts of home despite the fact that the mine is but 40 miles south of the Arctic Circle.

They get fresh vegetables in season—brought in 1,000 miles by plane from Edmonton, Alberta. They have steam heat. The mines in which they work are carefully wetted and sprayed to lay injurious dust. Electricity is provided by Diesel-powered generators.

These conveniences and methods in use at the mine, richest radium source in the world, were described before the American Institute by Dr. H. C. Parmelee, editor of Engineering and Mining Journal, who returned recently from a visit to the mine.

Operated by the Eldorado Gold Mines, Inc., a company headed by Gilbert La Bine, who discovered the pitchblende in May, 1930, the mine supplies the radium-bearing ore to a plant at Port Hope, Ont., which is producing a gram of precious radium salts a week and will soon be producing more.

Canada's farthest north mine is 1,400 miles by water from Waterways, terminus of a railroad connecting with Edmonton, Alberta's capital. The mine is 1,000 miles north of Edmonton in an air line. To meet the transport difficulties imposed by distance and the fact that waterways are open only three months a year, the company has organized an airline for handling mail, light freight and passengers.

Ore moves up river from the mine in the frozen fastness of Canada's north by means of steel power boats and barges. It is stored at Waterways until needed. Cost of moving the ore is now $40 a ton; when the mine was first begun it cost ten times as much to ship the same quantity.

Two portages, one of eight miles and the other 16 miles in length, must be made in moving goods by water. This has led, in the case of the eight-mile carry, to the construction of a pipe-line for transshipping fuel oil required for the settlement's four Diesel engines.

The main ingredient in both hair and fingernails is the same—a substance called keratin.

The United States draws on practically every country of the world for its supplies of crude drugs.

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Inks for marking glass, porcelain and metal. A silver monogram ink also is available.

A portable a.c. arc welder for heavy service. Made in four models, the outputs vary between 300 to 600 amperes. The transformers are designed to permit maximum cooling with the elimination of hot spots in the center of the coils.

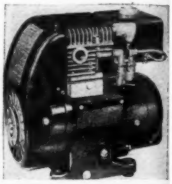
A knife useful for carving, trimming and decorating insulating board, for cutting paper, leather, asbestos, rope, cardboard, linoleum, and other similar materials. Extra razor type blades are contained in the cast iron handle.

Illuminated by a small electric bulb, this button light makes it easy to read the name on a door plate.

A blue print and map hanger for holding and filing drawings in the drafting room. It will hold as many as seventy-five prints having a total weight up to eighty pounds. Made of duraluminum, all edges are rounded so that prints cannot be torn.

A vulcanizer for making endless belts. Weighing thirty-six and a half pounds, it can be used while the belts are in place on the machine or on a bench.

An all-glass streamlined clearance light for use on passenger cars, trucks or trailers. Installation on a wide range of body curves is made possible by a heavy rubber pad under the metal base.



A gasoline driven generating plant having outputs up to 600 watts.

A portable air conditioner with an adjustable grille which diffuses the air throughout the room to meet varying conditions.

An elastic plastic which is used for mending rubber, leather, fabrics, clothing, linoleum, wiring insulation, and other materials. It is acid and water proof.

A Portable electric drill for operation on a six or twelve-volt storage battery. The chuck takes up to half-inch drill. The drill has no gears, and a specially designed motor gives it high speed for grinding or drilling wood, or a lower speed for drilling large holes in iron.

An automatic mixer using a spring motor. Can be used for preparing malted milk drinks, milk shakes, beating eggs, whipping cream, etc.

A yard light for homes, farms, camps, etc. It is for use around building entrances, private garages, stairways, gates, pumps, and other outdoor locations where good illumination is required.

A sandblast hose which includes a ground wire in it so that discharges of static tend to ground through the hose rather than through the body of the operator.

A small electric ventilator for use in stores, homes, restaurants, taverns, or any other place where forced ventilation is required.

A radio trouble shooter chart for service men and experimenters.